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EDITORIAL NOTES.

Parliamentary Weakness and the Chemical Manufacturers.

A GREATER piece of parliamentary weakness in connection with Private Bill Legislation can surely never have been witnessed than has been seen over the residuals restriction question by the imposition of the proviso upon the South Suburban Gas Company and the Swansea Gas Company which curtails their purchasing powers of residual products to the proportion of one-third of their own production. The proceedings, taken together with the last issued model clause bearing upon the matter, suggest that there is something cut-and-dried about these decisions, which are diametrically opposed to the recommendations of the Joint Committee. When we duly consider the character of the effort made on behalf of the chemical manufacturers on the Swansea Order by the Hon. J. D. Fitzgerald, K.C., and the baldness of the evidence given by Mr. William Pearce, M.P.—not a particle of which in any way altered the evidence laid before the Joint Committee—it is only fair to ask whether in this matter the chemical manufacturers are to dominate Parliament rather than the considered judgment of a Joint Committee of the two Houses? Has Parliament not sufficient strength to refrain from abusing, at the behest of the chemical manufacturers, the recommendations of a Joint Committee appointed by the two Houses for a specific purpose? The chemical manufacturers, it is common knowledge, have a strong representation in the House, and no doubt considerable influence.

The last imposition of the one-third restriction is upon the Swansea Company; and it has been made to apply to the whole of their lands—old and new. They had their power of purchasing residuals taken from them in 1912, before the Joint Committee, after a very full investigation, reported that there should not be any restriction of the liberty of a gas undertaking in dealing in the secondary products of other gas undertakings. Relying upon the loyalty of Parliament to the recommendations of a Joint Committee of their own appointing—who were instructed to "consider "whether any, and, if any, what, restrictions should be "imposed on gas authorities with respect to the purchase "and manufacture of the residual products resulting from "the manufacture of gas by other authorities"—the Company asked for the repeal of the restriction of 1912, seeing that it was contrary to the finding that one gas undertaking should be "allowed to purchase the residuals of other gas "undertakings, in order to manufacture other products of "the same kind as the purchasing undertaking is manu-"facturing from its own residuals." But what has been the result? That Mr. Hugh Law's Committee have, following the course taken by Sir Harry Samuel's Committee in the South Suburban case, said in effect to the Swansea Company: "You shall, in defiance of the recommendations of "the Joint Committee appointed for the specific purpose of "settling this matter once and for all, be deprived of com-"plete freedom, and to the extent of two-thirds of your own "production, you shall not be allowed to purchase from other "concerns, but only to the extent of one-third." It is not a matter for argument whether or not the one-third proportion is injurious. What is matter for argument is whether anything fresh has transpired since the Joint Committee's report to justify the infringement by Parliamentary Committees of the principle of complete freedom then laid down so far as gas-works residuals are concerned. The observance of this principle the gas industry must defend; and for it they must continue to fight. There is no restriction upon the wealthy chemical manufacturers. They are free lances in their trading; and the same competitive freedom —a free field, and no favour—is all that the gas industry desires.

In this Swansea case, Mr. Hugh Law rightly brushed aside all that had transpired in Parliament prior to the sittings of the Joint Committee (before whom the only complete evidence was, or has been, laid) by the assertion that, in the view of his colleagues and himself, the report of the Joint Committee must govern the general policy of Parliament in the matter. This being so, why bother more? But Mr. Law went on to ask for reasons to be given in support of the one-third proviso inserted in the South Suburban case. Did either Mr. Fitzgerald or his witness, Mr. Pearce, supply any evidence "in support?" A careful examination of the verbatim notes does not disclose any. They did not prove that the gas industry has done anything, or has in contemplation anything prospective, to warrant any restriction of any kind; while not a tittle of evidence having the slightest local bearing was offered in justification of the unreasonable and utterly illogical attitude of the chemical manufacturers. The Joint Committee themselves said that they had not "dealt with the suggestion made, that the "gas undertakings might make the trade of chemical manu-"facture their more important business, since *no evidence* "*was produced to lead them* [the Committee] *to anticipate such* "*action*." Such evidence was not produced because it has no existence. All that Mr. Fitzgerald and Mr. Pearce had to say "in support" of the proviso was very much up in the clouds, was hypothetical, and was the product of their fertile imaginations. How the Committee, sitting in a judicial capacity, could have seen anything in the subtle but unproved statements of the one, and the feeble efforts of the other, really passes comprehension. The making of allegations and not proving them does not, as a rule, satisfy a judicial tribunal. Mr. Balfour Browne, K.C., Mr. George Andrews, and Mr. Charles Carpenter all assured the Committee that gas undertakings have no intention of making the chemical business superior to their gas business; all they really want is the protection that absolute freedom gives the gas industry in the maintenance of proper markets.

On the part of Mr. Fitzgerald, there was ambiguous statement as to what the gas industry has been doing; reference to a practice that has grown up; and more balderdash of the same order. Yet not a jot of evidence to prove it. One of Mr. Fitzgerald's lucid statements was: "It is "quite clear that they [the Joint Committee] were con-"vinced of the danger of allowing these gas companies an "unrestricted right to trade in the way they *seem* to have "been doing." Where the Committee expressed any such conviction, Mr. Hugh Law and his colleagues were not informed; and the "seem" indicates the incapacity to produce solid evidence, but a subtleness of statement likely to influence minds of less legal magnitude than that of Mr. Fitzgerald. To assert to the Select Committee that the plain words of the Joint Committee bore the interpretation that restriction should be placed upon gas undertakings is as amazing and as amusing as listening to a man swearing that black is white. For the Committee, however, to accept the assertion is amazing, but far from amusing. Supposition and accusation predominated in Mr. Fitzgerald's speeches to the Committee. Here is an example: These big companies "evidently have it in their minds that they might "like to go in for this manufacture of chemicals on an "enormous scale, which would, in effect, drive out the ordi-"nary trader." What did the Joint Committee say in answer to this piece of supposition?—that there was no evidence to lead them to anticipate such action; and that they were "satisfied that this point could be better dealt "with as it arose." Did Mr. Hugh Law's Committee anticipate any such action on the part of the Swansea Company? Did the chemical manufacturers advance even a modicum of material evidence that the Company were contemplating any such action. No! Then why, in opposition to the Joint Committee's recommendation, restrict until the point arises in connection with the Company? There was also a sneer—an unbecoming sneer—on the part of Mr. Fitzgerald at the protection the gas industry desires for its numerous small units, which are not in such a good position to take care of themselves in this matter as the larger gas undertakings.

There is also the point as to the driving out of the ordinary chemical traders—private traders who have fastened them-

selves on the gas industry, and fattened enormously, and who now desire Parliament—unrestricted traders as these chemical manufacturers are—to protect them by constituting them the sole purchasers of such gas residual products as they themselves work-up, save such tar as can be disposed of for road and local purposes. The "driving out" of the chemical manufacturers is absurd. There was also the stupid and careless submission that the gas industry was about the only source for raw material that these terribly oppressed chemical manufacturers have; and yet Mr. Pearce had to confess that he, at all events, was not before the Committee to say that the gas industry was the only source. But even he did not appear to know much, and so was not prepared to inform the Committee as to the proportions of raw material that are produced by the different carbonizing industries of the British Isles. It was a pity, however, that he did not tell the Committee that, including small non-statutory gas undertakings, the coal carbonized for town gas supply in the United Kingdom and Ireland does not exceed 17½ million tons a year; while the coal carbonized in coke-ovens and elsewhere (other than by the gas industry) amounts to about 19 million tons—true this is not all treated upon the bye-product recovery system. He was not in a position to inform the Committee that, from ammoniacal liquor and by the direct process of recovery, the yield of sulphate of ammonia in 1913 by carbonizing systems other than those of gas-works was 238,000 tons, while the ammoniacal liquor from gas-works only produced 182,000 tons. He did not tell the Committee that the yield of tar from the systems of carbonization other than those employed on gas-works may be taken as about 10 gallons per ton—the same as for the coal carbonized for gas-producing purposes. The absurdity of injury to the chemical manufacturers is shown the deeper one goes into the matter; and they know, and we all know, that they are not likely to lose a single gallon of material if their prices are fair, as they must be if open competition prevails.

Then there was the silly slur, too, on the part of Mr. Fitzgerald upon the business acumen of the men engaged in the gas industry, when he remarked: If gas undertakings "can go unrestricted into the market, and buy up whatever "they like in the market, they can always afford to pay more "than the fair market price, because they can put their own "bye-products into their business at any price they like, and "if there is a deficiency in any way in the working of the "chemical business they can throw the deficiency upon the "gas consumer." Even assuming there were any gas administrators foolish enough to pay more than the fair market price, other gas undertakings and other gas consumers would benefit; and even this would be infinitely better than having such restriction that market prices could be fixed by the purchasing chemical manufacturers at their own sweet will. Time was when most gas undertakings could tell of very attenuated prices for tar, which only the competition of road authorities with the chemical manufacturers and the tar distillers set right; and through restriction—there is no other reason for the campaign for purchase limitation—the chemical manufacturers again desire to get a large control over the residuals of gas manufacture.

Where is this one-third restriction going to end? What possible good can it be to the chemical manufacturers to get the residuals purchasing powers of the South Suburban and the Swansea Companies limited to one-third? If this were the designed end of their efforts, their action would be simply ludicrous. They are out for something more than this; otherwise they have been very improvident with their money. It needs no assumption and no argument to help one to see that this is the beginning of a new campaign, and the screw will be given another turn on every possible occasion, despite the report of the Joint Committee. We saw the beginning of this campaign when the last model clauses were issued; we saw it again when Mr. Macassey, in connection with the proceedings on the South Suburban Bill, openly boasted of the chemical manufacturers' plans. It is convenient, after what has happened on the Swansea Order, to remind readers of his words: "The Association "were seeking to make it obligatory by means of an altera-"tion in the Model Bill, and by means of an alteration in "Standing Orders, to have that general embargo imposed "on all gas companies—*i.e.*, that by Standing Orders gas "companies should be prohibited from going beyond the "business of manufacturing their own residual products." This does not look as though there is going to be contentment with even the one-third restriction; any more than there will be contentment by the gas industry with anything less than the principle of complete open markets. It is easy to see the objective. To-day it is one-third; to-morrow it may be one-eighth; and ultimately the old request for the complete elimination of purchasing powers. At every step in the proceedings on the Swansea Gas Order, the chemical manufacturers have tried for something fresh—even at the last moment their Parliamentary Agent was arguing with the Agent for the Swansea Order before the Committee about the insertion of additional words in the restricting clause; but he was unsuccessful in this step. We are faced with a new plan of campaign, and the chemical manufacturers have, so far, in certain parliamentary quarters, received encouragement, in utter defiance of the Joint Committee's report. We are sorry to see this. It helps to shatter confidence in the fairness and openness of parliamentary proceedings; and it is altogether impossible to reconcile the present position with the former well-earned victory in a contest in which the chemical manufacturers were the aggressors. Only self-interest animates them; the gas industry have the interests of the public to guard as well as their own. The injustice of the whole proceeding, following on the Joint Committee's report, is galling to an industry which succeeded before a proper tribunal in proving its right to freedom—a freedom possessed by the chemical manufacturers and the other coal-carbonizing industries. As we said when dealing with this matter on May 12 last, the violation that has taken place of the Joint Committee's recommendations is a matter that ought to be seriously raised in Parliament, and that without further delay.

Illuminating Power and Calorific Values.

THERE has been some interesting correspondence in the "JOURNAL" on the subject of calorific standards, in which correspondence Mr. H. E. Jones and Mr. W. R. Herring have been taking part. In view of the fact that Parliamentary Committees, under the suggestion of the Board of Trade, appear to be disposed to consider the standard (apart from conditions attaching to it) for each concern on its merits, it is a good thing that certain points should be ventilated; and more especially as we think that there would be some danger in giving the parliamentary authorities cause to believe that there is any sufficiently marked ratio between illuminating power and calorific value to warrant them in adopting for any range of illuminating power figures a common B.Th.U. multiplier in order to arrive at an approximately fair calorific standard. Such a method, in our opinion, would be crude and unreliable.

Before, however, looking into this particular point, there are the opening remarks in the letter published to-day by Mr. Herring which call for comment. He says that in this matter, legislative enactments are being laid down which may involve considerable trouble and expense to alter in the future should such be found necessary in the interests of any special undertaking. We do not think Mr. Herring means by this that the matter of fixing and applying calorific standards should have been postponed. A start must be made somewhere; and in 1906 our correspondent was himself advocating the adoption of a calorific value standard, so that it cannot be said that precipitate action has been taken. As to alterations of standards involving considerable expense, it has been the lot of certain undertakings to have their illuminating power standards modified several times, and they have not found it any great pecuniary hardship. He also thinks that had the collective opinion on the calorific question of the members of the Institution of Gas Engineers been gleaned at the recent meeting, it would have been of considerable value. We are afraid the members of the Institution, as a body, have not so far taken much interest in the matter, though it has been coming to the front commercially and legislatively all these years. However, there would really not be much good discussing the question as to the standard itself, in view of the obvious intention of Parliament to give individual consideration to this point on every Bill. And it is pretty certain that, if Select Committees are not disposed to be guided by a Joint Committee of the two Houses, appointed for the purpose of directing them as to the course to be pursued in regard to the residuals restriction, they would not pay much heed to the collective opinion of the Institution of Gas Engineers on the subject of a calorific standard. What the Institution, however, have decided to take into consideration—the conditions under which standard calorific value tests should be carried out—is distinctly a matter upon which the represen-

tations of professional gas men will be acceptable by, and will receive the respectful consideration of, the Metropolitan Gas Referees, who have the defining of the conditions on which London tests are to be made, and these are customarily adopted for the whole country.

On a previous occasion, Mr. Herring affected to show in our columns that there is a relationship between calorific value and candles with gas of the quality supplied in London. "Constitution" is a better term than "quality," as is recognized by Mr. Herring in pointing to the influence of the chemical composition upon calorific power. We have Mr. Jones, too, saying [see June 23, p. 983] that there is a distinct relative proportion between illuminating power and calorific value, excepting where a large proportion of water gas may be included. We are not prepared to say that there is anything fundamentally reliable about using the illuminating product of the consumption of gas at the rate of 5 cubic feet an hour in an argand burner as the divisor of the number of B.Th.U. per cubic foot of gas in order to ascertain this relationship. It is a very crude method, as Mr. Jones's figures exemplify. The Gas Light and Coke Company and the Manchester Corporation, for instance, are shown to have supplied respectively gas containing 18 per cent. and 19 per cent. of carburetted water gas, which is not a material difference. Here we have the higher calorific value per cubic foot giving 33·8 B.Th.U. per candle; and the lower calorific value per cubic foot, 37·2 B.Th.U. per candle. If Manchester had applied to it the 37 B.Th.U. multiplier given in Mr. Jones's letter per candle supplied, it would have to furnish gas of 624·56 B.Th.U. per cubic foot gross, instead of as now, gas of 570 B.Th.U. gross. Further, as showing the crudeness of drawing a common multiplier from figures such as we have in Mr. Jones's letter—and from which figures he deduces that "at or about 14 candles illuminating power the British "thermal units would come to about 37 per candle"—we find that only five out of the ten undertakings named supply between 14·25 and 14·61 candle gas; four others between 15·24 and 15·70 candle gas; and one 17-candle gas. This 17-candle gas (supplied by the Bradford Corporation) only works out to 36·3 B.Th.U. per candle (without water gas), as compared with the 37·2 B.Th.U. per candle for the Gas Light and Coke Company's 14·35 candle gas, with 18 per cent. of carburetted water gas mixed with it. Here by dividing the calorific value of 1 cubic foot of gas by the illuminating power product of gas consumed at the rate of 5 cubic feet—though the calorific power per cubic foot in the case of the straight coal gas of Bradford is 617 B.Th.U. gross, against 534 B.Th.U. of the mixed gas of the Gas Light Company—the average calorific power per candle of the lower grade gas is higher than that of the richer gas. This does not show the "distinct relative proportion between the illuminating "power and the calorific value, excepting where a large pro-"portion of carburetted water gas may be included." What it really does show is the unfairness of the method. We have for curiosity sake turned up an efficiency test for the Dessau system of eighteen retorts per setting at the Mariendorf station of the Imperial Continental Gas Association at Berlin. The quantity of gas made per ton in the test was 13,430 cubic feet, containing only 1·2 per cent. of nitrogen. The illuminating power, tested by the Carpenter burner, was 10 candles; and the B.Th.U. gross 542·6, equalling 54·26 B.Th.U. per candle! The lower the candle power, the higher the calorific power per candle figure; the higher the candle power, the lower the calorific power per candle figure. The further this matter is investigated, the more convinced are we that the gas industry will be getting itself into trouble if its lay calorific value legislators are encouraged to adopt from such compilations as that of our friend Mr. Jones a B.Th.U. multiplier per candle. The relationship is of such a rough character that we prefer not to give adherence to the suggestion.

It is important, too, that this calorific power question should not be surrrounded by other standard regulations. We have had all too much of restriction in the gas industry; and we must have the largest possible freedom in selling our commodity on its quality and its merits as other commodities are competitively sold. Mr. Herring says that, in his view, unless the calorific question is considered with the chemical composition of the gas, we may be easily led into a false position, and fix a standard that may give us as much trouble in the future as the candle standard has given us in the past. We do not think the position is one that need be taken so seriously as that. It is true that the chemical composition of the gas is of great importance in this connection; but we do not want to have any more compulsory rules and regulations applied to gas supply. In our opinion, the trouble upon which Mr. Herring has his eye will automatically right itself in time. If not, then the gas undertakings abusing their privileges must take the consequences. We know of tests by a qualified chemist of gas in certain areas that has shown upwards of 20 per cent. of inert constituents; and we know how these affect, especially nitrogen, to a greater extent the flame temperature of gas than (as we remember Mr. Jacques Abady put it in a lecture on this subject in 1912) the illuminating power of the gas as measured in the No. 2 burner or the calorific power as measured in the calorimeter. There is certainly agreement with Mr. Herring that there is false economy in the over-pulling which sends to consumers' burners such a large proportion of inert constituents. Instead of doing this, our correspondent recommends the dilution of gas by the admission in the coal-gas retorts of blue water gas having a calorific value of 300 B.Th.U.; and of this he says it is possible to mix as much as 20 per cent. The only drawback is that the size of the flame at an incandescent burner is reduced in proportion to the blue water gas used. This is a matter that was dealt with by the Photometry Committee of the German Association some eight years ago. In the course of the report then made, which was signed by Dr. Leybold, it was stated that, when coal gas is diluted with non-carburetted water gas, the volume of mixed gas led to the burner has to be increased as the proportion of the blue water gas rises, if the mantle is to be properly heated. "This difference in behaviour is to be "explained by the decreasing size of the flame as the pro-"portion of blue water gas is raised—the gas being thus "oxidized before it reaches the surface of the mantle." However, this does not dismiss Mr. Herring's contention, as any small disadvantage which can be easily overcome has to be set against the general economy. We hope that the points raised will be further discussed, as they are very important at the present stage of the transition from one standard of quality to another.

Electrically Generated Gas and Explosions.

CENTRAL station engineers have their full measure of worry and trouble over their distribution systems, and defects reveal themselves in a most unpleasant and inconvenient manner, not only to the engineers themselves, but to the patrons of electricity. The fact that bitumen embedded cables could develop, under certain circumstances (such as a short-circuit) a gaseous vapour, which, exposed to a continuing high temperature, would become cracked-up into highly inflammable and poisonous gas—increasing pressure in a confined space causing it to become more violent—is a matter that has dawned but slowly upon them. Until certain lively occurrences produced great destruction of property and personal injury, and in one case two deaths, and on which occasions the origin of the gas was traced home by scientific aid, it had been the inveterate custom of our electrical friends to blame coal gas. It was a convenient scapegoat, possessing qualities that fitted in with the theory and readily-made accusation. But when there was no longer any doubt, and when there was complete realization as to the origin of the disastrous explosions, and as to the whole of the elements necessary to the creation of an explosion being inherent to the bitumen-bound distribution system, electrical engineers became very uneasy over the matter, though they tried to hide their uncomfortable feelings as much as possible. The serious explosion at Nottingham, the tragic event at Hebburn-on-Tyne, other less destructive explosions, and frequently recurring ones of minor importance, but still always with the knowledge hanging about them that it was more by good fortune than anything else that the consequences were not worse, resulted in the Board of Trade appointing a Departmental Committee to investigate the whole question. Their report has been issued; but we cannot say that the Committee have subscribed to the stock of knowledge on the subject. All they have done has been to sort out known facts, and to draw conclusions from them. Their recommendations cannot touch the existing systems. They have only, in minor matters, been able to point to those practices which past experience shows are less generative of the conditions that give rise to explosions, in the hope that future work will follow the lines of greatest safety. In the first place, they have been able to exonerate, as having contributed to serious cases of explosion, alter-

nating current systems, concentric mains, or lead-covered paper-insulated cables; and the evidence shows that three-core cables may be added to the list. There is also no evidence of trouble where the cables have been embedded in a pitch compound.

The culprits in the more serious explosions have been cables on continuous current supply, for most part insulated with india-rubber or vulcanized bitumen, and either drawn into bitumen casing or laid solid in bitumen. But in view of the small number of disastrous accidents that have so far taken place compared with the large extent to which vulcanized bitumen cables laid solid in bitumen have been used, the Committee are unable to recommend the Board of Trade to discontinue to approve of the system. Contrast this with the absurd recommendations to the Board as to the use of gas on railway trains, the danger of which is hypothetical, and hugely magnified by prejudice and by electrical interests. In the case of gas-lighted trains, precedent to the supposed danger must be an accident; in the case of these bitumen-covered cables in our public streets and alongside our houses, they constitute a complete self-contained gas-generating plant—the gas highly inflammable and poisonous—with gas-igniting power independent of any outside aid, such as is required before there can be explosion in, for instance, the case of escaping coal gas. The Committee hesitate to recommend disapproval of future work on this system, notwithstanding the lives lost, the personal injuries inflicted, the property destroyed, and the frights given to pedestrians, although there are other practical systems with a reputation for committing less injury. The Committee point to the fact that there are thousands of miles of cable (in fact, it is estimated that mains to the value of 2½ to 3 millions sterling have been laid with bitumen filling) on the explosion-producing system. That the explosions have been comparatively few compared with the length, is a matter for some thankfulness. But one never knows when or where this sort of thing is going to happen. As a rule there are no indications; and the distribution of the disturbing and destructive occurrences shows that they are most erratic. The process of deterioration is constantly going on; and it is a question whether the thousands of miles that have shown fairly good behaviour in the past may not be more productive of trouble in the near future. Cables that have been running for years and giving no trouble have, after an explosion has caused an opening-up, shown that deterioration has been going on over a considerable length. The Hebburn cable which caused such terrible havoc had been in use eleven years without signs of trouble. These things all point to physical change and deterioration. Freely it may be admitted that the contact of coal gas with bitumen will cause it to soften; but any bad effect from this action has not been traced in connection with any of the cables which have been the seats of the explosions that have been investigated. The action in these instances has been wholly electrical.

It looks as though greater recourse will have to be had in future to the use of lead-covered cables or other systems—such as running in earthenware troughs or else separate troughs for each cable. But these methods are more expensive, and the latter ones occupy more space. It is this greater expense that is likely in many cases to induce electrical engineers to take the risk of clinging to the bitumen or pitch compound filling. Although the limits of explosibility of the gases generated by bitumen and pitch compound are about the same, the fact remains that no serious explosions have been traceable to systems embedded in pitch compound. This is experience to its credit. But, on the other hand, while the carbon monoxide content of the bitumen gas is of serious amount—serious if it percolates into residences—the constituent in the case of gas from pitch compound has a much greater percentage. The gas from plain pitch has a far higher inflammability than that from either of the other two fillings; but its carbon monoxide content is just about the same as that from bitumen. In view, however, of these two dangers of the fillings, the practice of laying cables with them under impervious pavements close to the foundations of houses—this practice being followed so as to save expense—is to be deprecated. In both the Nottingham and Hebburn cases, the bitumen-covered cables were laid quite close to the property bordering the streets; and the Committee think it requisite to exhort to great care in this regard, and to advocate the running of armoured services into houses requiring a supply of current. They also advise that wooden troughing should only be used where the soil is suitable; and they further urge the Board to insist upon the responsible officials of electricity supply undertakings reporting all explosions, in order that the information may be published for the general benefit.

We cannot say that much good has resulted from the inquiry. Nothing has been done, except to show where the greatest public dangers reside in electrical distribution systems; and the Committee have altogether failed to produce anything materially directive for the Board of Trade. The greatest value of the report lies in the fact that it has concentrated a larger amount of attention on a matter the importance of which cannot be denied.

High-Pressure Meter Testing and Stamping.

The three Metropolitan Gas Companies have arrived at an agreement with the City Corporation and the London County Council regarding the testing and stamping of high-pressure meters, clauses dealing with which appear in the General Powers Bills that the two authorities are promoting in the present session. The London Gas Companies, no doubt for very good reasons, have settled this matter, despite the position taken up in regard to it in their petitions against the two measures. On most of the disputed points, there has been concession; but we still think that, instead of the testing and stamping of high-pressure meters being legislated for only in respect of the Metropolis, it would have been better to have had the work dealt with, as a piece of general legislation, and through the Board of Trade, at the time the Board were in a position to take up the long overdue revision of the Sales of Gas Act.

Few changes, but important ones, have been made in the clauses. It was proposed that the provisions should become operative as from April 1, 1915, in respect of new high-pressure meters, and a year later in respect of all existing meters. In regard to existing ones, a year's grace indicated that the Corporation and the County Council were rather inclined to an excess of zeal in the matter; the twelvemonth being quite an unreasonable period within which to get present fixed meters tested and sealed as suggested. The testing of each meter, under the terms of the clauses, is not in itself to be a light matter, but the inconvenience of having consumers' supplies disorganized, and the work done "in a hurry," was the objectionable feature. However, the provisions are not now to have application to existing meters until April, 1920, which is an important prolongation; but new high-pressure meters will come under the regulations as from April 1 next. One of the principal objections raised to the clauses, in our earlier criticism, was as to the proposal to put meters under a pressure "equivalent to double the pressure or maximum "pressure at which the meter is constructed to be used." Before the words "maximum pressure," the words "in the "case of a compensating meter" now appear. With regard to the proposal as to "double the pressure," the objection to it was that it was unreasonably high, and might put an excessive strain on the meter casing, which strain might later on disclose itself in an uncomfortable manner. It was suggested in our criticism that 25 to 30 per cent. excess of the maximum pressure at which the meter was designed to work would be an ample margin of safety. The modification that has been effected has not brought the excess to the figures suggested; but it has made a considerable difference, as seen by the following proviso appended to the clause: "Provided that where the pressure or (in the case of a com-"pensating meter) the maximum pressure at which a meter "is constructed to be used exceeds 25 lbs. to the square "inch, the pressure under which the gas shall be passed "into the meter shall be equivalent to one-and-a-half-times "the pressure or the maximum pressure (as the case may "be) at which the meter is constructed to be used." Provision is still made for the affixing to, or adjacent to, the meters of suitable gauges or other devices to ascertain the pressure at which the gas is being supplied. There are no other changes worth mention. However high-pressure meter testing and sealing is now close upon introduction into London; and what is being done there will rapidly spread to the rest of the country. Other large centres have the matter already in view.

The German Association Meeting.

Pending the comments which we shall be making upon the proceedings at this meeting in next week's issue, it may be said that the small party of Englishmen who this year made the journey to Munich to attend the meeting, and to inspect the

exhibition, "Das Gas," received the usual hearty welcome that Germans always extend to their brothers from across the sea. Indeed, where gas is concerned, all questions of international rivalry (which at all times are more evident in the Press than elsewhere) are quite put aside, and peace reigns in the happy family of gas men. Of the meeting itself, little need be said to-day. But may we ever be spared the tedious, and seemingly endless, speeches of welcome from state authorities, local authorities, and societies of all kinds, which occupied so much valuable time on this occasion before the serious business on the first day. There were no fewer than nine of them; and some of the speakers—eminent men no doubt—had a great deal to say. A commendable feature, however (and a striking contrast) was the shortness of the votes of thanks. Surely any reader of a paper would be quite as content with a simple expression of thanks in one sentence from the President (as is the German custom) as with a speech by one member, supported by a speech from another member, and then a show of hands from the assembly. A small point perhaps, and a question of custom; but surely worth consideration when time so often proves too short, as at the recent meeting in Liverpool.

The Munich Exhibition—"Das Gas."

Comparisons are odious, and in any case a comparison of the Munich exhibition with that held at Shepherd's Bush last year would be fraught with great difficulty, owing to their different natures. For the organizers of "Das Gas" either have not wished, or have not been able, to produce a common exhibit of the applications of gas without inter-firm competition, such as was conceived and carried out in London last October. Without wishing in any way to decry the wonderful work accomplished in the production of that exhibition, the results of which, reported from all parts of the country, almost defy criticism, it may be of interest to mention two comments made by representatives of the British gas industry after an inspection of the Munich show. One was: "The finest gas exhibition I have ever seen." The other: "Even more likely to attract and interest the public than our National Gas Exhibition last year." All credit to the Germans if they have succeeded to this extent. True, Munich offers them the advantage of a hall of large size, built with the sole object of housing exhibitions. This is only one example of the foresight which characterizes the planning and laying out of the fine city. Full advantage has been taken of the opportunity afforded by the extensive and handsome approach to this hall for a display of gas lighting. Full advantage has also been taken of the space in the hall; and the excellent arrangement of the exhibits has obviated any idea of overcrowding. And accordingly, to all accounts, the exhibitors have been willing to pay high prices for their space. It certainly is a fine show, and gives in an interesting form the complete life-story of gas, from its birth in the retort-house to its first and final service in the domestic or industrial appliance.

The Best Form of Exhibition.

But we may, and do, still hold our own opinions as to which is the ideal form of exhibition in the interests of the whole industry—whether the competitive or the non-competitive. Can the public concentrate their attention so well on the claims of gas, when the claims of one appliance maker as against another thrust themselves forward at every turn? Let this all-important point not be lost sight of, when reports of the magnificence of the Munich Exhibition are spread abroad; and, while congratulating our German friends on the success they have achieved, we must not forget the undeniable success achieved, in certainly more difficult circumstances, by the British gas industry at the National Gas Exhibition of 1913.

Gas-Cookers.

The section which seems to have struck the English visitors most was the cookery department, and above all the cookers. More than one of them was heard to say "Wake up, England!" in this connection. It was even hinted that English gas-cooker makers have been having rather a snug time for some years, and may in the near future have to look to their laurels. Instead of the heavy black iron-work which characterizes the average English cooker, the German type is made of white-enamelled sheet iron, and has a much lighter and cleaner appearance. But in a country where maintenance of cookers on hire plays such an important part in costs, such stoves might not be so economical to gas undertakings. They are designed to give the consumer every possible advantage and convenience. Efficiency is obtained at a reasonable cost; and there is no denying the German article is more attractive than the English. It is no doubt necessary to strive after higher efficiencies in the designing of cookers; but at the same time it must not be forgotten that the average user of one of these almost indispensable household articles probably understands more about appearance and convenience than about efficiencies and gas consumption. The duty of the gas-stove makers is to give him both.

Suction Gas and Town Gas.

We know how hard hit suction-gas plants have been by town gas supplied at a low rate. Birmingham, for example, has a splendid record for the eviction of the, to the users, tiresome and labour-creating suction-gas producer. The low efficiency, the variability of the gas, the starting-up troubles, dirty valves, labour, housing, greater capital outlay, and repairs and maintenance generally operate to cause gas-engine users to return to town gas after having been burdened with a suction-gas plant. There is a sense of freedom with a supply of clean town gas on tap after experiences with suction gas. A short report in our "Miscellaneous News" shows how, with gas at 2s. 8d. at Fleet, the Aldershot Gas and Water Company have secured the supply to the engines at the District Council's sewerage works—the Consulting Engineer (Mr. Flower) showing good cause why he has a preference for town gas, and an aversion to being saddled with suction-gas plant.

The Past Financial Year.

Reports continue to come to hand giving the results of the working of municipally owned gas-works during the past financial year, and many points of interest are revealed in them, though the outstanding feature is in all cases the same—dearer coal and cheaper residuals. At Belfast, the net profit, at £45,000, is £21,000 down, as compared with the previous year—due to the causes just named. The ratepayers are handsomely assisted by the undertaking; but it is gratifying to note that at the same time the consumers are to enjoy a further reduction in the already moderate net price of gas. Blackburn has passed through the ordeal of a strike, which has left its mark on the finances of the gas undertaking, as well as on those of the employees. The net loss of £10,000 on the year's working will, however, soon be made good; and meanwhile it is satisfactory that, in spite of difficulties, both the make and sale of gas per ton of coal carbonized reached record figures for the undertaking during the period under review. The make of gas was practically the same at Burnley as in the previous year; but a good deal more was sold, owing to a satisfactory reduction in the "unaccounted-for" item, from 4·09 to 2·77 per cent. The balance of £86,000 at Edinburgh is insufficient by £24,000 to meet the charges for annuities and interest, and the statutory contributions to the sinking and reserve funds. This amount will be made up out of the accumulated surplus of previous years. Nearly 3 per cent. more gas was sold in the past twelve months; and it is pleasing to record that coal contracts for 1914-15 have been arranged at substantial reductions on last year's prices. A net profit of £16,500 at Oldham has been turned into a loss of £10,400; and if to this there is added the £7500 which the Corporation are entitled to appropriate in aid of the rates, and a sum for depreciation of cooking-stoves, the deficiency reaches £19,581. This amount, again, is more than accounted for by the increased price of coal and the decreased value of residuals. The output of gas increased substantially, as also did the total number of consumers. Among other places which show that the demand for gas is in a highly flourishing condition may be mentioned Smethwick, the four works which are included in the Stoke-upon-Trent Corporation Gas Department and Warrington—all of which report an increase of output.

The Nitrate Half Year.

Aided, of course, to a considerable extent by favourable weather conditions (except during March), the consumption of nitrate of soda in Europe for the first six months of this year shows an increased consumption of 166,000 tons; the actual figures being 1,497,000 tons, compared with 1,331,000 tons for the corresponding half of 1913. This represents an increase of 12½ per cent., which is spread in varying proportions over the different countries of Europe, with the single exception of the

United Kingdom, for which a decreased consumption of 2½ per cent. has to be recorded. The countries outside Europe also increased their consumption by 6¾ per cent., though in the case of the United States a falling off to the extent of 15 per cent. has been experienced. The world's consumption for the twelve months just ended is calculated to have been 6 per cent. more than for the year ended June, 1913. These figures are taken from the half-yearly report of Messrs. W. Montgomery and Co., who express their strong belief in an ever-increasing demand for fertilizers of all useful kinds. At the same time, they remark that they "fail to see that any good end can be served by producers of nitrate of soda forcing the pace unduly, as was the case during the past season, and as is still the case, judging by the production figures advised each month."

Production and Prices.

On the subject of prices, the report has a good deal to say. The fact is recalled that, finding last summer prices were dwindling away to an unsatisfactory level, owing to apparent overproduction, owners made vigorous efforts to bring about a restriction, and were finally able to announce the settlement of a scheme by which 60 per cent. of the producing power agreed to restrict their output for the six months to Jan. 31 by some 90,000 tons. When this became known, there was a rise in price; and so far all seemed well. Unfortunately, however, as so often happens with restrictive efforts of this kind, everything did not turn out just as it should have done. The 40 per cent. of producers outside the "combine" turned out more nitrate; while as regards the 60 per cent. who were parties to the agreement, they, Messrs. Montgomery gently state, "were found, upon the expiry of the term, to have adopted a new method of returning their monthly production." Into the rights or wrongs of the matter it is unnecessary to enter here; but it will be understood that the effect was to largely counteract the 90,000 tons restriction. This, and a heavy fall in freights, brought a greater supply of nitrate to market for the actual consuming season than had ever been anticipated. In fact, the supply was at all times in too great abundance to permit of any buoyancy in prices. The value of arrived and due cargoes at the beginning of January was about 9s. 7d. per cwt. cost and freight; but during the first week in April 9s. and 8s. 10½d. were accepted for several cargoes, and up to the end of the half year the market had no rallying power.

Undue Preference.—In the editorial article on this subject in last week's issue, there appeared towards the end the words: "Even should the appeal unfortunately be lost." Some question has been raised as to the interpretation of these words; but, of course, the whole tenor of the article shows that the intended meaning is: "Even should the appeal unfortunately result in a reversal of Mr. Justice Sargant's decision," &c.

The Policy of the "B.C.G.A."

As bearing on an "Editorial" in last week's issue of the "JOURNAL," we reproduce below a letter addressed to the "Electrical Times" by Mr. W. M. Mason, the Secretary of the "B.C.G.A." Mr. Mason writes to our contemporary:

Sir,—In your current issue it is suggested that the action of the Ilford Gas Company in seeking an injunction against the District Council to prevent them from running show-rooms, &c., and of the Long Eaton Gas Company in obtaining an injunction to prevent preferential terms being given contrary to the Electric Lighting Acts, form part of "a systematic campaign for clipping the wings of municipal electrical enterprise" which is "a natural corollary to the formation of the British Commercial Gas Association."

Will you allow me space to say that this Association has had nothing whatever to do with either of the two actions in question? The "systematic campaign" referred to exists only in the nervous imagination of those who are conscious of the many occasions for victory which would be afforded in such a campaign by the devious policy of a certain few reckless individuals who try to push municipal electric enterprise at any price, and regardless of either equity or economics—in contradistinction to the sound policy followed by the majority of municipal electricity departments.

Anyone who has followed carefully the publicity campaign of this Association will know that it has been carefully kept free of attacks upon electricity, and confined entirely to advocating the claims of gas—a fact that has been cordially admitted by the Electrical Press. Where the gas industry has been unfairly attacked, we have occasionally assisted in its defence; but our policy is strictly *pro*-gas, not *anti*-electric. We believe that there is ample room for both gas and electricity in the service of the community, and that much money could be wasted on both sides in unprofitable competition and in mutually counteracting publicity, if that fact were not recognized.

PERSONAL.

Mr. E. H. RAPLEY, of Hawkhurst, has been appointed Manager to the Brackley (Northants) Gas Company in place of their late Manager who has been in their services over thirty years. Mr. Rapley will take over his duties about the middle of August.

At the meeting of the Leeds City Council last Wednesday the following resolution of the Gas Committee was confirmed and passed: "That the resignation of Mr. H. HULSE, the Manager of the Meadow Lane Gas-Works, be accepted, and that a gratuity of £400—equivalent to one year's salary with house, light, and coal—be given him; and the Committee places on record its very high appreciation of his long and faithful services extending over a period of forty-five years."

The position of General Manager and Secretary to the Rhymney and Aber Valleys Gas and Water Company, which will be relinquished by Mr. Arnold W. Branson on his removal to Hartlepool, has been filled by the appointment of Mr. J. PROSSER JONES, who has been with the Company for about fourteen years. Shortly after Mr. Branson joined the Company in 1907, Mr. Jones was officially appointed Assistant Manager and Secretary, in which position he has made himself exceedingly popular in the Valleys.

It was mentioned in the "JOURNAL" last week that Mr. HUGH ADAMSON, of Banbridge (co. Down), was to receive the Albert Medal of the second class, for gallantry displayed on the occasion of an explosion at the gas-works in the town. The medal was awarded by His Majesty the King on Monday, the 29th ult.; and the circumstances which led to this act of Royal recognition were recorded in the "London Gazette" next day as follows: "On the afternoon of Dec. 3 last the Manager of the Banbridge Gas-Works (co. Down) was engaged in examining a gas-exhauster which had become choked, when a loud explosion occurred, blowing out the window of the engine-house. Hugh Adamson, who is a labourer employed at the gas-works, had just left the engine-house on a message for the Manager, and was thrown down by the force of the explosion. On getting up, he saw the exhauster-house in flames, and, hearing the Manager's call for help, burst open the door, which had jammed, and found him enveloped in flames, but managed to drag him outside, and then collapsed. On recovering, Adamson succeeded in turning the gas into another gasholder; thereby saving the premises from being blown up, though the engine-house was actually destroyed. Adamson was severely burned, and the Manager succumbed to his injuries a few days later."

OBITUARY.

JOSEPH CHAMBERLAIN.

The death last Thursday of the Right Hon. Joseph Chamberlain, in his seventy-eighth year, as the result of heart failure, calls for notice in these columns on account of the conspicuous part he took nearly forty years ago in the transfer of the Birmingham gas and water works to the Corporation. In 1874 the Birmingham Gaslight Company, of which Mr. Charles Hunt had lately been appointed Engineer, had to go to Parliament for power to extend their works. Mr. Chamberlain was Mayor at the time; and the suggestion was made to him that the opportunity was a good one for the purchase of the undertaking of the Company and of that of the Birmingham and Staffordshire Gas Company. He interviewed the Directors of both Companies, with the result that the Board of the latter agreed to sell on the basis of their maximum dividends being secured to them in perpetuity, and that of the Birmingham Company agreed to part with their undertaking for a lump sum. Owing to this agreement the Bill of the Birmingham Company was withdrawn; and the following year the Corporation applied for the necessary power to purchase. This was granted; and the concerns became municipal undertakings. It is scarcely necessary to say that Mr. Hunt was to a large extent associated with the transfer; and his subsequent work under the Corporation was fully dealt with in the "JOURNAL" on the occasion of his retirement in 1902. In the same session a Bill was promoted to enable the Corporation to acquire the works and plant of the Birmingham Water Company; and these were taken over on Jan. 1, 1876. The progress of both undertakings, since they have been in the hands of the Corporation, has been fully recorded in the "JOURNAL." So far as the gas undertaking is concerned, testimony has been borne from time to time to the ability displayed by Mr. Chamberlain, in his capacity of Chairman of the Gas Committee, in conducting it; and we ventured in the "JOURNAL" to predict that he would some day find himself a member of the Cabinet, and probably Chancellor of the Exchequer. It is unnecessary to deal here with his political career. His death has removed one who not many years ago filled positions in which he affected very materially the destinies of this country.

The death took place last week of Mr. JAMES JOHNSTON, J.P., the Chairman of the Coatbridge (N.B.) Gas Company. Mr. Johnston had been for many years engaged in the oil trade in Glasgow, but had retired from business.

The death occurred, at Old Basford, Nottingham, last Thursday, of Alderman JOHN PARR FORD, J.P., the oldest member of the Corporation, whose municipal work had been mainly in con-

nection with the gas undertaking—he being the senior member of the Committee, of which he had been Chairman. Deceased, who was 86 years of age, acted for many years under the late Alderman John Barber as Vice-Chairman of the Gas Committee, and during the period following the latter's death succeeded to the chairmanship, which he held until the appointment of Mr. E. Harlow in 1894, when, in consequence of his advanced age, he reverted, at his own request, to his former less onerous office, which he continued to hold down to the time of his death. His participation in the operations of the Gas Committee naturally covered a time of marked development both as to the capacity and character of the works. Deceased was also for a long period Chairman of the Lighting Committee, and accorded his hearty support to the more enterprising policy entered upon during the last ten years, in which some notable improvements have been effected in the illumination of the main thoroughfares.

NOTES FROM WESTMINSTER.

DURING the past week, the only matter of importance that has come before Parliamentary Committees, so far as gas is concerned, is the agreement, between the three London Gas Companies and the City Corporation and the London County Council, as to clauses regarding the testing and stamping of high-pressure gas-meters. The clauses are reproduced in our "Parliamentary Intelligence," and comment upon them appears in our leader columns. Before Mr. Hugh Law's Committee, there has been a settlement of the one-third residuals purchasing restriction in the case of the Swansea Gas Company's Order; and there has been adjustment before Sir John Barron's Committee, of the clauses in connection with the contest between the Hayward's Heath Gas Company and the promoters of the Balcombe petrol air gas scheme—a matter to which reference was made last week. The British Gaslight Company have secured, as against the Norwich Tramways Company, protection for their distribution system in excess of that allowed under the Tramways Act of 1870—it having been proved that the proposals of the Tramways Company extended to matters not covered by the clauses in the General Act. These clauses are also set out in our "Parliamentary Intelligence;" but there is no point about them which requires special reference here.

ELECTRICITY SUPPLY MEMORANDA.

THERE has been interest in reading the reports of the proceedings at the recent meetings in Birmingham of the Incorporated Municipal Electrical Association and of the Point Fives Association in order to see how opinions are wagging among our electrical friends. The reading ends with a feeling that the wagging is of a very erratic character. It may be confessed that it would be a very poor world if we all thought and acted the same. Uniformity in all things would make life fearfully monotonous. But in the electrical world, opinions vary to such a degree that policy and all else appear to be in a very chaotic state. Even the statement of ordinary facts, which are evident and readily capable of verification, has among our electrical friends such wide divergence that, if there is truth on one side, then there must be falsehood on the other, or an amount of pretence or omission that amounts to the latter quality. We get examples of this sort of thing in the assertions made regarding the relative capabilities of gas and electricity, some of which statements are of a reckless character, and quite incapable of being substantiated. It is so very easy to say that this or that can be done at a lower cost by means of electricity than by gas, and so much more efficiently. The truth or otherwise is derived from practice and experience; and practice and experience do not uniformly subscribe to the truth of electrical statement. Quite distinct from statements that are intended to weigh with consumers, there are equally unreliable ones regarding other matters which affect the gas industry; such as the untruth concerning the British Commercial Gas Association that the careless tongue of Mr. Grogan let slip, to which reference was made in our editorial columns last week, and which falsehood has reference to an action that is *sub judice*. Getting away from the unsavoury subject of misrepresentation, we see that there is no settlement yet, on the part of electrical professional opinion, as to proper tariffs; the opinion goes on oscillating, and that somewhat violently. It is also observed that, according to some electrical opinion, there is no difference now between the costs of cooking by electricity and by gas; and that electrical water heating, owing to some freakish mood of Nature, has been suddenly brought up to an equality in cost—not in time, and not in volume in relation to time—with the processes of heating water by gas. It is all very wonderful; indeed, it is miraculous. Then it is further remarked that Mr. J. H. Bowden, at Poplar, is about to adopt a policy that is going to entirely eliminate gas from the streets; and he prophesies the passing of gas for heating purposes, about which Mr. C. H. Wordingham has serious doubts. Mr. S. E. Fedden says a "great many consumers [in Sheffield] have had their gas-fires taken out," and, we assume, have had electric-radiators put in. The interpretation of a "great many" is not given; but in another part of his speech, Mr. Fedden speaks of a connection of 150 radiators through the rateable value system! We find much of this sort of thing in the speeches made on this occasion. Obfuscation is an art much favoured and practised by electricians. They are, for example, very fond of speaking of their increases being so much per cent. We have one man telling us that he has had an increase in his cooking load of 100 per cent. If he sold for this purpose 5 units one year and 10 units the next, he would have had an increase of 100 per cent.! The diversity of opinion and statement in the electrical profession makes a very substantial load.

A Diversity Load.

Suggested Irregularities in Tariffs.

One of the most striking features about the meetings of the two Associations was the very clear evidence that quite a number of electrical engineers are not convinced as to the soundness of the basing of charges on a percentage of the rateable value, and then making a running charge of (say) ½d. or 1d. per unit for all current consumed. From the inception of the system, we have pointed out how unfairly, how inequitably, such a system must work, even in one district of supply; and we have also pointed out where illegality may be committed through the system. In the case of a house in a district producing a low rental, it would be rated at a considerably lower figure than another house equal in size in the same district of supply producing a higher rental. The consequence of this is that the occupier of the low-rated house, *cæteris paribus*, obtains his electric supply at a lower price than the higher rated occupier, and so has preference. Mr. John Christie, of Brighton, at one of the meetings, also provided an illustration of illegality. He remarked that in Brighton they have several customers who live in very beautiful flats with very small accommodation; and, on a rateable value system, these would pay out of proportion in comparison with those occupying large family residences in a lower rated neighbourhood. A resident in one of these flats might be paying on the rateable value system 2s. 6d. per unit, while a big family man might be getting current at 1¼d. Under such circumstances, there would be a great deal of "undue preference;" and certainly the 2s. 6d. per unit would be in excess of the maximum price of 8d., or whatever other price is the maximum, under the Brighton statutory powers. However, Mr. Christie seems to be persuaded that better than the rateable value system is the keeping of a high tariff for lighting, with a low flat-rate for cooking, &c., and no meter-rents. With a flat-rate of 3d. per unit for lighting, and a 1d. (with 10 per cent. discount) for heating and cooking, he finds that many consumers are paying an average of 1¼d. to 1½d. per unit, which would be as low as they could get current for on the rateable value and 0·5d. per unit system. In Mr. Fedden's speech at the Point Fives meeting, there was something that appears to be very much like a case of undue preference. He says that, in Sheffield, they have a number of little shops which keep open until eleven o'clock at night; and he has arranged a rate by which he hopes to get the whole of the custom of these shops. Every shopkeeper who guarantees to use all his lamps for four-and-a-half hours per day throughout the year gets a discount of 50 per cent. off his lighting rate of fourpence, and off his penny rate for heating and cooking, and everything else. So successful, he says, has this scheme been that he has now a revenue from it of £10,000 a year. We undertake to say that, if some of the other consumers' accounts were examined, it would be found that these small shopkeepers were obtaining a preference over certain more profitable customers.

The "Norwich" and the "Bowden" Tariffs.

From what has already been stated, it will have been observed that there are electrical engineers who are not prepared to subscribe to the reputed excellencies of the rateable value system. It is a system that (while Mr. A. H. Seabrook would say that it answers its purpose) is fundamentally wrong, in that it has no application whatever to the cost, in any shape or form, of the commodity dealings in which it is intended to serve. It is based on something quite foreign to itself, and something that is caused to vary materially in every supply district through local circumstances and structural age and other conditions which affect the rateable value of property. Under the system the price obtained for the electrical service must diminish with the deterioration of the property. Mr. J. H. Bowden, of Poplar, describes it as a pernicious system; "a no more pernicious system," he says, "has ever been introduced into electricity practice." This is a sweeping condemnation. The "Electrician" editorially expresses itself as "glad" that Mr. Bowden, in his paper, exposed the weakness of the rateable value tariff, "for there is a great deal that is illogical about it. Rateable values vary enormously according to the district, and have no real relationship to the amount of electricity that is used in lighting." There are others who hold diametrically opposite opinions; there are others, too, who are convinced that the rateable value and 0·5d. are insufficient charges in some areas, and that the 0·5d. should be raised. Dr. Jervis, of Brighton, points out that medical men have usually to live in a fashionable quarter, or in a business thoroughfare; and so their assessments are often higher than consumers whose electricity requirements are about the same, but who can choose some other quarter for residence. Mr. Bowden has tried to evolve a system of charging

which, by adaptation, he says, is possible of application to any area of supply. The principal feature of the system is that "each consumer obtains the benefit of his own load factor; or, in other words, the good consumer does not make up for the bad one." Mr. Bowden does not claim spotlessness for his system of basing the charge on the potential demand of the consumer. He sees room for criticism in the human tendency to extend the number of watts allowed for in the fixed charge; in the difficulty of properly assessing the demand where a number of radiators and other domestic utensils are installed; and in the opportunity for giving preferential treatment in making assessments. Mr. Bowden's critics see in the system a mass of crudity and complication; and an onerous duty in making fair individual assessments for the fixed charge, and in keeping them up to date. But the author of the system finds nothing but good in it from the electrical standpoint. He seems to think that it will be a means for snuffing-out gas supply, and making electricity the only agent employed in the Poplar district for domestic lighting and heating. The Commercial Gas Company do not show signs of trepidation. Aërial flights are the order of the day in electrical circles.

Experiences at Grimsby.

Mr. W. A. Vignoles, of Grimsby, in a paper of somewhat wearying length, is not so ravenous or boastful as some of his friends in municipal electrical service. Although he says that "electricity being, as is well known [that is, among electricians] superior to gas [humorous Vignoles!], it is possible to get consumers to pay more for it." Mr. Bowden, on the other hand, asserts that it is now practical to supply at a price that will compete with gas. This is what has been said in electrical circles for many years. But Mr. Vignoles sides with truth when he intimates that consumers have to "pay more for it." Full well consumers know this, if they have used the two lights equally in respect of time and illuminating power. Our Grimsby friend goes further, and remarks that there is a limit to getting consumers to pay more for electricity; and "unless the price is at such a level that the consumer is satisfied, no amount of advertising or pushing will create permanent business." Then he makes further confession; and it is this: In Grimsby supply is being given to consumers at present whose annual outlay only just reaches 30s.; while with slot meters many consumers are paying less than this. With such a small revenue, he admits that it is extremely difficult to meet all charges. It is pretty certain that there are many electricity concerns that, if they had kept to really profitable business, would have shown better balance-sheets than they are doing to-day. However, in view of his experience with these poor profit-producing consumers, Mr. Vignoles now favours the lump-sum or rateable-value system, with a running charge of ¼d. per unit. There is much in Mr. Vignoles' paper, but not many novel points. One that comes in the category of novelty is that the Grimsby Electricity Department, in addition to offering free advice to all consumers for a small fee—2½ per cent. on the value of the work—undertakes to prepare a specification of what is required, and superintend the carrying out of the work. Where is the Association of Consulting Engineers? They have been raising objections to this kind of thing elsewhere. Perhaps this is fry of a character that it would not be dignified on their part to notice.

A Development Committee.

There was another point in Mr. Vignoles' paper, the spirit of which we like. He suggested to the Municipal Electrical Association that a Committee should be formed for the purpose of assisting, through publicity, the development of the electricity industry. In this connection he is not in the least narrow-minded. It is his belief that an energetic policy and advertising campaign on the part of both gas and electricity undertakings would not, as is sometimes feared, hurt either, but would be of benefit to the consumer, as it would keep him informed of all the uses to which electricity and gas can be put, while the competition would keep both departments alive and up-to-date. We do not see that there was during the proceedings even a mention of that weakling, the Electricity Supply Publicity Committee, whose career has been a chequered, and not by any means a prosperous, one. The policy of the Committee of, in its early days, traducing gas in order to attempt to advance the interests of electricity was a grave error of judgment; and many administrators in the electrical industry privately acknowledged this. It would not be far wrong to say that the policy and the pusillanimity that the Committee displayed had something to do with the refusal to contribute to the funds, and with the miserable results of their efforts. There is, of course, another reason for the absence of funds, which is that such a large proportion of the electricity supply of the country is controlled by local authorities, who have views, legal and otherwise, as to their contributory powers. In the Municipal Electrical Association's Bill, there is a clause designed to get over the difficulty of subscribing to such an Association; but whether the Bill is ever likely to succeed becomes more and more speculative. However, with regard to Mr. Vignoles' proposal, it was agreed—with the activities of the British Commercial Gas Association dangled about to encourage support—that a Special Committee should be formed (not necessarily comprised of members of the Council) to deal with any matters that may tend to encourage the use of electricity from the public supply mains. There is also to be an invitation to join to other Associations and persons who may be in a position to assist in furthering the objects for which the Committee is formed.

The Association's Bill.

The members of the Association appear to be losing heart over their unfortunate and ambitious Bill, by which it is hoped to secure wiring and fittings and financial powers in excess of what Parliament has hitherto been prepared to give. Another session is fleeting; the Bill is where it was; and this being so, it matters little that the Electrical Contractors' Association refuse their adherence. The contractors know the strength of their position; and they do not mean to yield an inch of the ground that they consider to be the right of private enterprise as against municipal trading. Early in the year, the Association made an effort to get a place for the Bill. They circularized all the Municipalities, asking them to get their members of Parliament to do what they could for the Bill, and to ballot for a place. In the report of the Council, it was stated that the result was that "no place was secured which could be of practical use." The Hon. Secretary (Mr. H. Faraday Proctor) let the "cat out of the bag" at the meeting when he confessed that the result of the circular was that "they had not been able to obtain more than two or three promises up to the date of the taking of the ballot." He had to admit that, if the members of the Association could not get their members of Parliament to do something in the matter, it would be impossible to get the Bill through on present lines. An alternative suggestion, made by Mr. Proctor, was that a number of members should join together and promote a Joint Bill, instead of relying entirely on the Association Bill. The Hon. Solicitor of the Association encouraged the idea of a joint promotion, by stating that "there were precedents among the gas companies who had promoted Bills jointly for removing the restrictions upon *the right to send sulphur fumes into houses and public streets;* and they had been successful in getting these restrictions removed." We should like to know the name of the Hon. Solicitor, and, if he would do so, discuss with him the veracity of his statement. At the moment, we can only reflect upon his words (if correctly reported) in a way that is not altogether complimentary to his knowledge.

[There are a few other matters arising out of the proceedings at the meetings to which attention may be directed in our next "Memoranda."]

PUBLIC LIGHTING OF PARIS.

Position of Gas and Electricity.

In a recent issue of the "Journal," reference was made to a series of articles on the public lighting of Paris, contributed to the "Génie Civil" by M. André Grebel. The author dealt with the subject in a very comprehensive manner; and we will endeavour to give an indication of the nature of his work.

Rather more than three years ago, M. Grebel described in the above-named publication the first installation of high-pressure gas lighting in France—viz., that on the Boulevard Raspail in Paris. Since then the system has developed rapidly in the capital and also in some of the large provincial towns. The electricians could not fail to be greatly concerned at the success of these powerful gas light centres; and the consequence was the production of improved lamps—among them being the enclosed mineralized carbon arc and half-watt incandescent electric lamps. Many engineers are of opinion that the latter is destined to supplant the flame arc lamp and the high-pressure gas-lamp. For the lighting of secondary thoroughfares, M. Grebel thinks these high-power incandescent electric lamps cannot at present be utilized, inasmuch as they are not made for the usual voltages and of 150-200 candle power. Gas consequently remains for the time being in undisputed possession of this part of the public lighting. It is employed with upright or inverted burners, singly or in groups, which work satisfactorily at the relatively high pressures of gas in the mains of Paris.

With these introductory remarks, M. Grebel proceeds to consider the respective positions of gas and electricity. It appears that on the 1st of January last the Electricity Distribution Company of Paris reduced their price from 70 c. to 50 c. per kilowatt-hour to private consumers; but the author says this concession, even with the use of metallic filament lamps consuming 1 watt per horizontal candle power, still leaves gas at 20 c. per cubic metre (approximately, 4s. 6d. per 1000 cubic feet), utilized in incandescent burners using 1 litre (0·035 cubic foot) of gas per horizontal candle-hour, much more economical, since under these conditions a kilowatt of electricity is equivalent to a cubic metre (35·3 cubic feet) of gas. The City of Paris has profited, in respect of the public lighting, by the reduction in the price of electricity just referred to. If to this is added the improvement effected in the yield of the new electric lamps, it will be seen that comparisons with high-pressure gas-lamps will have to be made on a revised basis, as their yield in light has not changed, nor has the price of gas been reduced. The specific consumptions of the lamps are extremely variable; those of the arc lamps depending to a great extent upon their regulation and the nature of the carbons, and those consuming high-pressure gas depending upon its quality as well as that of the mantles.

In Paris the number of gas-lamps is incomparably higher than

that of electric lamps, which are exclusively arcs. Leaving out of account some lamps using oil and "lusol" (the commercial name of a benzol employed for lighting by incandescence in automatic vaporization lamps), and a few incandescent electric lamps in course of trial on the public thoroughfares, the number of lamps in service at the close of the year 1913 may be stated as:

Batswing burners, consuming 2½ to 7 cubic feet of gas per hour	2,036
Lamps fitted with single and multiple upright burners, consuming 1½ to 26 cubic feet per hour (low pressure)	51,625
Lamps fitted with single inverted burners, consuming 10 to 31 cubic feet per hour (low pressure)	1,184
High-pressure gas-lamps of 12 to 77 cubic feet per hour	1,243
	56,088
Electric arc lamps of 8 to 15 amperes	2,370
Total	58,458

The Municipal Council decided last year to extend the public lighting by multiple burners at low pressure and by others using compressed gas; and the Administration have since laid before them a much larger scheme, which comprises the use of high-pressure gas in all the important thoroughfares not at present lighted by electricity. In 1912-13, an agreement was entered into between the Municipality and the Electricity Company for the substitution of Bardon-Carbone lamps for the 2070 old arc lamps in use, as well as for the installation of 300 additional lamps. M. Grebel remarks that electricity has not yet made great progress in the public lighting of Paris; and the same observation applies in the case of many of the large old cities—for example, Berlin. It may be of interest to give, for purposes of comparison, the following figures relating to that city:

Length of Thoroughfares Lighted in 1913.

	Miles.
Upright gas-burners at low pressure	242
Inverted gas-burners, at low pressure	13
Inverted gas-burners at high pressure	50
	305
Electricity	17
Total	322

Lamps in Use in 1913.

Single and multiple upright gas-burners of 80 to 240 Hefner candles, at low pressure	19,375
Lamps with two and three inverted burners of 220 and 330 Hefner candles, at low pressure	890
Lamps with three inverted high-power burners, of 500 and 1000 Hefner candles, at low pressure	1,362
Lamps (old form) with one and two upright burners, of 450 to 2400 Hefner candles, at high pressure	386
Lamps with two and three inverted burners, of 2000 to 4000 Hefner candles, at high pressure	3,970
Total gas	25,983
Arc lamps of 400 to 4000 Hefner candles	896
Metallic filament lamps of 50 to 200 Hefner candles	324
Total.	27,203

M. Grebel describes and illustrates the Bardon-Carbone lamp to which reference has been made. The Municipality have adopted six types of this lamp—three (8, 10, and 15 amperes) for continuous and three (10, 12, and 15 amperes) for alternate current, and they are suspended in the lyre-shaped tops of the old arc-lamp pillars at a height of 18 feet. They are generally from 98 to 114 feet apart, and are placed alternately on each pavement. In certain of the principal thoroughfares—the Avenue de l'Opéra, the Rue Royale, and the Grand Boulevards—there are also candelabra upon the refuges in the middle of the roadway, so as to obtain powerful illumination.

M. Grebel next deals with the cost of electric lighting in Paris. He puts the annual cost of a new 10-ampere continuous current arc lamp at 934 frs. 5 c., which works out to 42·45 c. per candle-year for a mean effective lower hemispherical power of 2200 candles. The cost of a 12-ampere alternate current lamp is given as 909 frs. 85 c. per annum, which works out to 51·7 c. per candle-year for a mean effective lower hemispherical power of 1760 candles.

With these figures, M. Grebel brings his first article to a close. The rest of his communication is left for future notice.

The Institution of Civil Engineers President's Reception was held last Thursday in the new building in Great George Street. S.W. After a large number of members and distinguished guests had been welcomed by the President (Mr. Anthony G. Lyster), Mrs. Lyster, and the Council of the Institution, the party dispersed throughout the handsome hall and lecture theatre to listen to concerts of vocal and instrumental music. A large collection of engineering models and scientific apparatus was installed in the corridors, committee rooms, &c. Among other things shown was a grate section of the new coke motor (as recently illustrated in the "JOURNAL"), with its working bars and coke feeders in action. This was exhibited by Mr. Thomas Clarkson; while Messrs. Sir William Arrol and Co. had a working model of the latest form of Temperley grab-transporter. The Hon. R. C. Parsons showed (in action) a new form of chemical injector for water-mains—to soften, harden, or clarify the water; and Mr. Walter Hunter had on view a model filter-bed for the Accra Water-Works.

WILTS COUNTY GAS COMPANY'S PROSPECTUS.

A Big Capital and Hypothetical Custom and Results.

ANOTHER of the progeny of the United Gas-Works Development Company, Limited, is an undertaking with a fine-sounding and extensive territorial claim about its title—The Wilts County Gas Light and Coke Company, Limited. We admire the ingenuity of the little *clique* of men who are running the promoting concern in the discovery of attractive appellations for their pretentious pigmy schemes. The present venture is, in our judgment, one of the most impudent that has yet issued from that quarter; and we say this notwithstanding the appearance on the prospectus of the names (as Directors) of Sir George William Kekewich, Mr. F. C. Murray, M.Inst.C.E., Mr. Frederick Colman, a Director of the East Pembrokeshire Company (one of the flotations of the Development Company), and hailing from the same office address, and Mr. Albert Augustus Scanlan, who is a Barrister-at-Law, and has "F.R.G.S." after his name. The prospectus of the Wilts County Company also bears on its face a fine sheaf of Bankers, Brokers, Auditors, Solicitor, and Engineers. The Engineers have been associated with the previous promotions of the Development Company. They are George A. Smith and Sons, "Gas Consulting Engineers." Mr. G. A. Smith is the gentleman, the "gas consulting engineer," who reports on these pieces of speculative gas enterprise; and the reports—rural districts and sparse populations notwithstanding—come out with an excellent profit attached to the declared potential business. Our attempt to trace the credentials of George A. Smith to the title given him of "gas consulting engineer" has not been rewarded by success. We never heard of the gentleman before the Development Company came into being for the purpose of promoting gas schemes, with the beneficent object of carrying light into certain of the dark places of the country, and incidentally to make money. We have no information as to Mr. Smith having been articled to a gas engineer; we cannot trace him as ever having had the official management of a gas-works prior to the flotation of the promoting Company; his name has not been identified with any of the recognized professional Gas Associations of the country; and with all the information in our possession, and means of obtaining information, the name of this particular George A. Smith cannot be traced among those for years known to us as "gas consulting engineers." If Mr. Smith has been trained in gas engineering, and has experience entitling him to be known as a gas consultant, we shall be pleased to give his side of the story in our paper. But it certainly appears to be an easy thing to dub oneself in these days a "gas consulting engineer"—easier than the Westminster consulting gas engineers thought possible. Some of these gentlemen appear to have been until recently totally ignorant of the existence of Mr. Smith in their ranks, and equally ignorant as to his qualifications for admission. The Development Company not long since were negotiating for the services of a young gas engineer who has a respected name in gas-engineering circles, but the negotiations fell through. Had they not done so, it is possible his name would have appeared on the present prospectus.

The showy title chosen for this new venture of the Development Company would suggest that it is proposing to extend its wings over the whole of the county of Wilts. The Board of Trade returns, however, happen to indicate that in the county there are already eleven statutory gas companies and two statutory local authority gas undertakings, which between them already distribute in the county something like 610 million cubic feet of gas in a year, and do so on a capital—share, loan, and premium all told—of £401,652, which works out to about £658 per million cubic feet of gas sold. These figures do not include the several non-statutory concerns. Therefore, what justification is there for calling a concern to be carried on in tiny places in the county of Wilts, "The Wilts County Gas Light and Coke Company, Limited"?

The promoters, of course, play the old game of referring to the excellent dividends and the market prices of the stocks and shares of gas concerns that are as giants to this microscopic rural venture. Such concerns as Bournemouth, Croydon, Brentford, Harrogate, Hornsey, and Luton are quoted in connection with dividends, and several others in connection with market values of gas stocks or shares. The prospectus asks for a capital for the new concern of £30,000, divided into 3000 7 per cent. cumulative preference shares of £5 each and 3000 ordinary shares, also of £5 each. For the space of one year—another well-worn promoters' dodge—the vendors agree to pay 7 per cent. on the preference shares, and to guarantee a dividend on the ordinary shares of not less than 8 per cent. for the same period. The question of the character of the concern for which this £30,000 capital is required is worth looking into. The nucleus is the little Pewsey works. The latest information as to the business gives the annual make as 3½ millions, with about 160 consumers, 53 slot meters, 54 cookers, and 41 public lamps. It has taken over fifty years to get up to these figures in the truly rural district of Pewsey! Even if the consumption were 4 millions a year, the capital of £30,000 now asked for would average £7500 per million cubic feet! This figure will be interesting to gas men who are glad enough to see their capital down to less hundreds than these thousands per million cubic feet. But Mr. G. A. Smith, the Gas Consulting Engineer to the Company, has such strong vision that he sees in the more or less distant future a considerably larger consumption of gas, with which

point we will deal presently. Further as to the proposed capital, it looks unduly inflated when placed against the average of the gas sales of the statutory concerns in the county of Wilts of £658 per million cubic feet. But the Pewsey Gas-Works, with their diminutive gas sale, the Development Company are magnanimously going to sell to the Wilts County Company for £6450, together with the stock of coal, coke, and tar at a valuation. Of the sum named, £4450 is to be paid to them in cash (the Development Company do not mean to lose anything), and £2000 in cash or shares, at the option of the Company. Then the preliminary expenses are agreed at £1800, which is to be refunded to the Development Company, together with 150 preference shares and 150 ordinary shares. There has also been an agreement to underwrite £8000 of capital on a commission of 7½ per cent. We are pleased to see that "no part of the purchase consideration is for goodwill." The price to be paid for a gas concern with a 3½ million cubic feet business is in all conscience large enough as it is; we should like for comparison purposes to see the valuation placed upon the undertaking by a consulting gas engineer of our own selection. Let us add together the items so far mentioned:

Purchase price		£6,450
Preliminary expenses		1,800
150 preference shares and 150 ordinary shares	see above . .	1,500
7½ per cent. commission on underwriting. .		600
		£10,350

This money alone represents £2956 per million on the 3½ million sale of gas. Excesses of this kind have never in our experience been witnessed in connection with gas promotions. In view of the figures we have given, it would be interesting to know why it is proposed to raise the whole of the capital, before it can anyway be possible to profitably utilize a large part of it.

The prospectus and Mr. Smith's report are silent on the subject of the present business and the working and financial results. All the public are asked to found their trust upon is the hypothesis of the "Gas Consulting Engineer." He speaks of the considerable developments of the works and the extension of mains to places of most of which we had never before heard. Pewsey is the most important place of all, and 52 years' existence has only, according to the latest information at hand, produced 3½ million cubic feet consumption, and 160 consumers! Mr. Smith, however, thinks that now the new Company has come along, in Pewsey and from the extension of mains to the rural districts named, there will be an enormous increase in the sales. But, referring to the allusions in the prospectus launching this liliputian concern to substantial undertakings working in populous towns under statutory protection, the "Financial News" says:

When we turn to the Wilts County Gas Light and Coke prospectus in order to see what areas corresponding to Bournemouth and Hornsey it proposes to supply, we find that the south main extension of the Company will sell gas to the "town" of Manningford Abbas, which, we believe, has a population of 108, while the north main extension will supply, for instance, the "town" of Huish, which has a population of 115. Apart from the absolutely fallacious character of a comparison between such totally different areas of supply as Manningford Abbas and Hornsey, there is also to be considered the widely-varying character of the population. Hornsey and Croydon, for instance, are never asleep, but the greater proportion of the inhabitants of Huish go to bed about seven o'clock of a winter's evening, owing to their unwillingness (or their inability) to spend money on artificial light. It would be interesting to know whether these considerations presented themselves to the mind of Sir George Kekewich before he allowed his name to be placed on this prospectus for dispatch to unsophisticated women investors.

The great development that is to take place in slot meters, cookers, gas-boilers, and gas-fires (at 4s. 9d. per 1000 cubic feet!), with the mains extensions, enables the "Gas Consulting Engineer" to estimate the consumption at sight, including the present supply at Pewsey, at 39,500,000 cubic feet. In the whole of the county of Wilts there are only five statutory concerns—old established and well-conducted—that have a consumption as high as, or higher than, 39 millions, the districts not being populous ones. However, when the happy condition of a 39 million sale arrives, Mr. Smith calculates that there will be a net profit of £4946 16s. 5d., which is equal to 2s. 6·4d. per 1000 cubic feet of gas sold. Will Mr. Smith point out any other gas concern that makes a profit of 2s. 6·4d. per 1000 cubic feet of gas sold? On the arrival of these glorious times, the preference shareholders will receive a dividend of 7 per cent., and the ordinary shareholders 15 per cent.; and there will be a matter of some £1646 to carry forward to supplement the following year's revenue. How people can be fooled into parting with their money on such a prospectus as this, we cannot understand. There is nothing about the scheme to recommend it; but there is so much about it that is speculative, and the proposed capital is of such enormous weight for a concern of the kind, that all investors may be warned not to touch the proposal, but to put the prospectus in the waste-paper basket, which is its proper destination.

It is announced that the Honorary Council of the Oil Exchange has been joined by several gentlemen, among them being Sir Boverton Redwood, Bart., D.Sc., and Professor Vivian B. Lewes, F.I.C., F.C.S.

GAS-COAL CONTRACTS RENEWALS.

THE correspondent who forwarded for publication the article on this subject that appeared in our issue for June 23 last (p. 960) sends the fellowing remarks:

Now that gas-coal contracts have expired—although on some of the large tonnage contracts there are still arrears to be sent in—the real fight for terms for renewals commences. Many of the large gas concerns have already arranged for a good proportion of their requirements, at reductions of 1s. per ton on last year's prices; and it seems almost certain that this will be the basis of renewals—at any rate, at the larger works. [The contributor, of course, has not in view the Durham and Northumberland coalfields, in which large contracts have been effected at reductions of from 2s. to 2s. 6d. per ton.—ED. J.G.L.] The market generally is showing such weakness that many gas engineers are fully convinced they will be able to obtain even better terms by waiting a bit longer, as collieries are beginning to show a considerable amount of anxiety in regard to what are looked upon as "their" orders—*i.e.*, orders that have been renewed year after year with little trouble. It is very evident that a considerable amount of business has already been placed in other quarters than usual, owing to collieries holding out for the same prices, while other sellers have been securing new business by giving reductions. Generally speaking, gas engineers are in a somewhat independent position, so far as immediate supplies are concerned, owing to the heavy reserve stocks being held, especially at the larger works. In many instances, "spot lots" are being offered at considerably lower prices than collieries will quote for contracts. This in itself shows the weakness of the colliery position, which is no doubt to a considerable extent accentuated by the exceptionally slow demand for house coals. In many cases stocks at pits are unusually heavy, in spite of working having been reduced to three and four days per week. Gas engineers are certainly in a far better position to barter for terms than they have been for the last three years; and it is up to them to make the most of the opportunity.

Reported Representations to the Chancellor of the Exchequer.

In the "Daily Express" for the 29th ult., the following statement was made by the Special Parliamentary Correspondent. Readers must be left to themselves to appraise its value.

A matter of far-reaching importance has been brought under the notice of the Chancellor of the Exchequer by influential representatives of British gas companies. The case submitted may be summarized. At present practically the whole of the industries of the country are being exploited for the benefit of coal traders. The price of coal has been put up to a degree out of all proportion to the increase in the cost of working it; and so long as the demand is equal to, or perhaps a little beyond, the supply, there are no means of controlling the price. Of the total quantity lifted, about 20 per cent. is exported. It is obvious that, by adjusting the quantity sold abroad, the high price at home can be maintained. It has been pointed out to the Chancellor that there are two ways in which this may be dealt with. One, by re-imposing an export duty; the other, by recognizing that coal is a national asset of vital importance to the nation, and establishing a standard price, accompanied by a standard dividend to the owners, with variation upwards as the price of coal falls below the normal or standard. This, it is urged, would separate the legitimate demands of Capital and Labour in the coal industry from the dearness of the article. Insistence is placed on the fact that the principle of a standard price ruling dividends by means of a sliding-scale has operated with marked success in the case of the gas companies of the kingdom.

Gasholders as Direction Signs for Airmen.—It will probably be remembered that this subject was brought before the members of the Société Technique at their meeting in Toulouse last year; while at the recent congress in Paris it was stated that the National Aërial League had answered more than 260 inquiries for information, and that 59 gasholders had been marked. The matter was discussed at the meeting of the International League of Touring Associations held in London last Wednesday, and received with approval; and Mr. Stenson Cook, the Secretary of the Automobile Association, undertook to bring it to the notice of the Royal Aëro Club. It appears that experiments in Holland have proved that the signs painted on gasholders are clearly seen even at a height of 6000 feet; and it is claimed that the scheme is both practical and inexpensive.

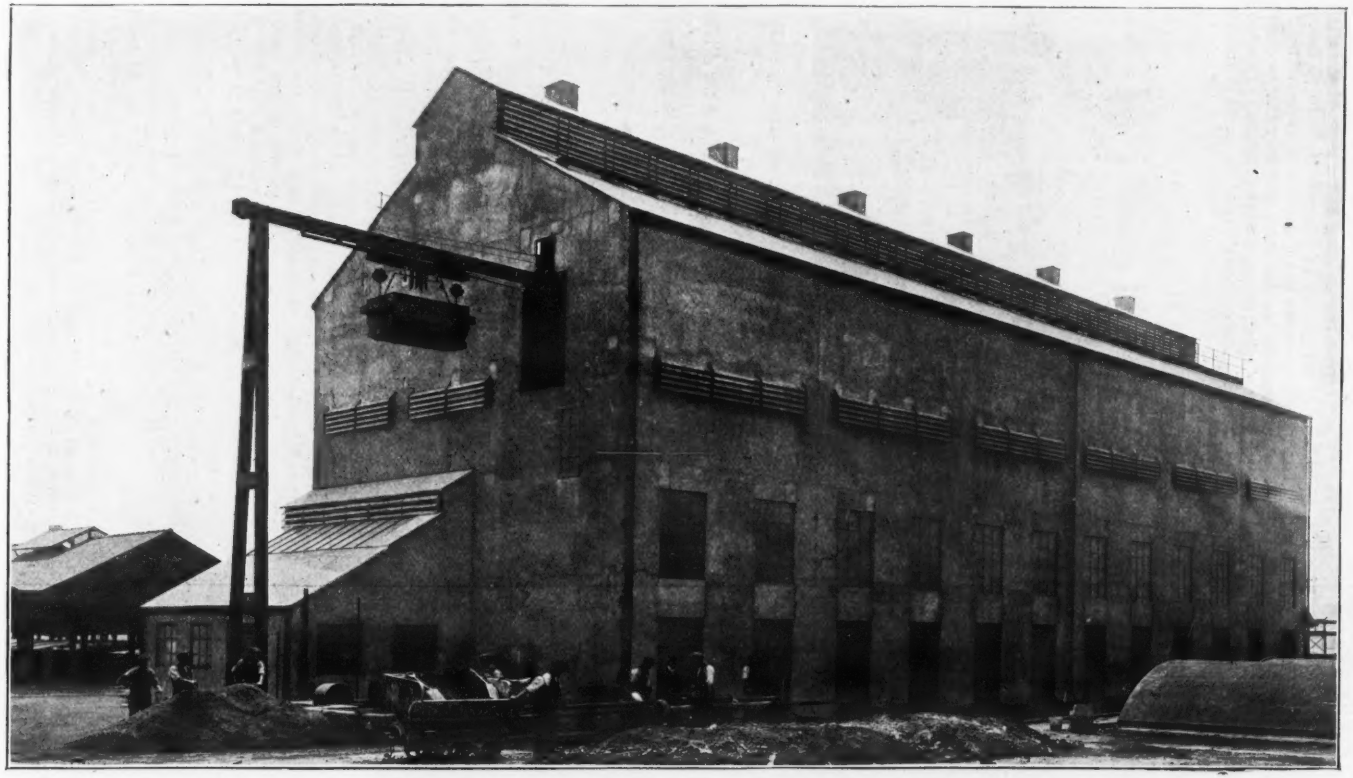
Apparatus for the Manufacture of Gas.—The current number of the "Journal of the Society of Chemical Industry" contains an abstract of the specifications of two patents taken out for the United States by Mr. J. E. Cochran, as Assignor to the National Gas Process Company, of Elkhart (Ind.), for apparatus for use in manufacturing gas. By the first patent, the gas is passed in succession through a number of compartments formed in a chamber by means of partitions; the first two compartments containing agents for removing impurities, and the others, through which cooling-tubes pass, serving as condensing chambers. Staggered baffles are arranged in the condenser compartments to force the gases into contact with the cooling tubes. By the second patent, the condensing chambers are replaced by a single chamber provided with hollow shell-like baffles projecting into it so as to form a tortuous and narrow passage for the fluid. A cooling medium is circulated through the baffles.

EAST GREENWICH SULPHUR PURIFICATION PLANT.

In the course of his lecture on "Purification by Heat" at the Liverpool meeting of the Institution of Gas Engineers last month, Mr. Charles Carpenter, D.Sc., described the plant which has been put down at the East Greenwich works of the South Metropolitan Gas Company. This consists of five units, each capable of dealing with 3 million cubic feet of gas per day.

The July issue of the Company's "Co-Partnership Journal" has, as a frontispiece, a "General View of the Sulphur Purification Building at East Greenwich;" and the photo block has been kindly loaned to us for reproduction.

The building in which the plant is housed has a steel framework, filled in on the "Hy-Rib" method of construction. Coke is brought to the outside of the house, and a telpher plant is utilized for conveying it to the hoppers inside—the skip being filled, raised, and emptied by the operation of suitable levers at the end of the house. The telpher is worked by a gas-engine, and has been so arranged that it can be employed also for a second installation of plant when completed.



WORKS TOPICS.

By "Modus Operandi."

Gas-Coke for Steam-Raising.

It is interesting to notice that some corporations are strangely ignorant of the importance of utilizing the bye-products from the gas undertaking in their own steam-raising plant. This matter has already been mooted in the "Journal;" but it is a question which requires a good deal of ventilation. Such striking indifference to ordinary business intelligence is beyond the understanding of most of us, who would naturally expect the coke and breeze made in the corporation gas-works to be used as boiler fuel in the municipal electric generating station, refuse destructor, water-works, and in other plant where steam is required. Apparently, however, this is by no means the case, for a search through the "Tenders for Coal," as advertised in the Technical Press, discloses the fact that several corporations require "Steam Coal" as well as "Gas Coal."

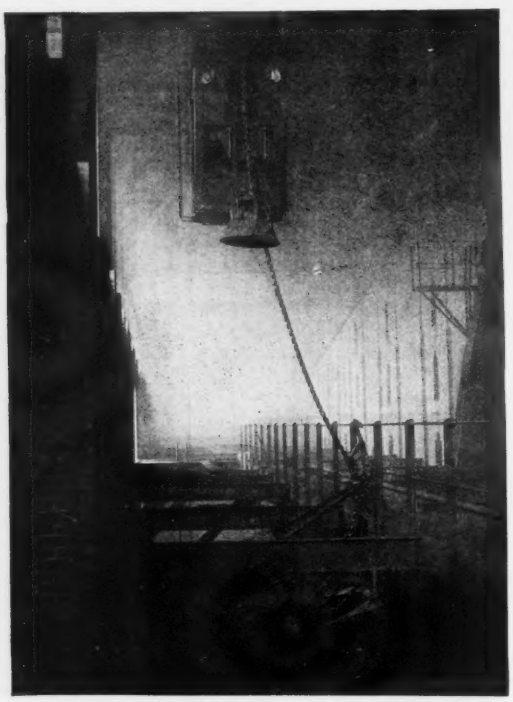
Investigation would probably bring to light the fact that these same undertakings are putting surplus coke on to rail at ridiculously low prices, with the result that some other undertaking which has built-up a good local coke market is forced to witness a slump in its own market as a consequence of the other's neglect.

Surely it is the duty of every corporation gas manager to make earnest efforts to ensure that the gas-works products are used for all the above-mentioned purposes. In a few cases such efforts may require some amount of personal persuasion, as many engineers are too conservative in their ideas to be easily converted to something that their fathers and grandfathers had not considered. One thing is certain; and that is that coke is a suitable fuel in all cases, though it is obvious that comparatively inexpensive alterations, such as the installation of forced draught apparatus, would be required in some boiler plants. For coking types of mechanical stokers—and only on these—it would be necessary to use a proportion of coal, on the lines described by Mr. E. W. L. Nicol in the "Journal" for March 3, p. 567. For hand-fired boilers nothing but a good draught and the use of small coke is required to enable a boiler to raise steam to its maximum capacity, as when fired with steam coal.

The gas undertaking should obviously be fully alive to the necessity of selling the coke at a figure to compete with the coal in use; but for this purpose it should be saleable at far better prices than those so often accepted for "surplus" coke put on rail. It should be borne in mind that B.Th.U. in the form of coke will raise appreciably more steam than B.Th.U. in the form of coal. This is a fact which is daily being ascertained by those undertakings that have been foremost in the field in the pushing of coke for steam-raising purposes.

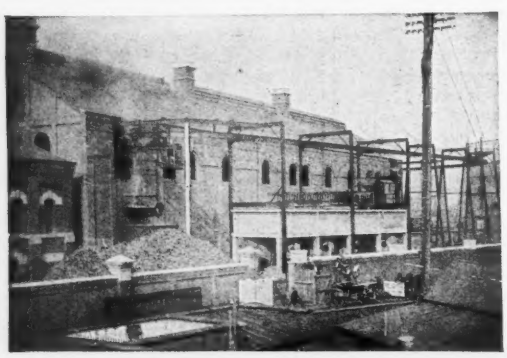
TELPHER EQUIPMENT AT THE SOUTHAMPTON GAS-WORKS.

An interesting example of the operation of an electric telpher equipment for the mechanical handling of coal and coke is to be seen at the works of the Southampton Gaslight and Coke Company. The apparatus was installed by Messrs. Aldridge and Ranken, of Westminster; the motors and control gear being supplied by the British Thomson-Houston Company, Limited, of Rugby.



Telpher Machine at Southampton Gas-Works—Grabbing Coal.

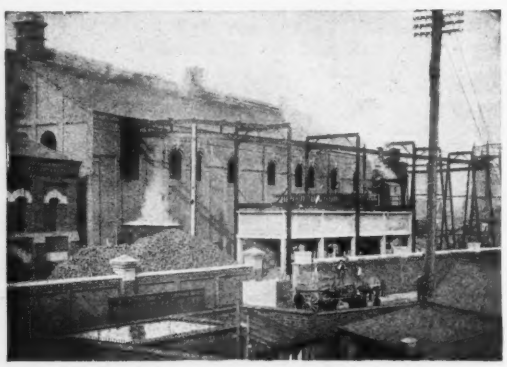
The telpher machines, of which there are two at the works, run on overhead mono-rail tracks; the one used for coal handling being at a height of about 46 feet above the floor of the coal store. The length of this track (which is endless) is about 370 feet; and the turn at each end is made by a curve of 15 feet radius. The coal is discharged into the store by means of coal trolleys, and is then picked up and disposed of by an automatic grab attached to the telpher machine. The hoisting gear of this machine is operated by a 15 H.P. "K.A. No. 8" type motor, and is capable of lifting loads of 50 cwt. at the rate of 60 feet per minute. The motive power for travelling purposes is supplied by a 6 H.P. "K.A. No. 6" type motor. In addition to being used for storing purposes, this machine supplies coal to other plant in the works at the rate of 20 to 25 tons per hour.



Telpher Equipment at Southampton Gas-Works—Quenching Coke.

The second machine, which is used for coke handling, travels on an endless track which runs the whole length of the retort-house, and is continued out into the coke yard. The track is at a height of about 40 feet above the ground, and has a total length of about 450 feet—the radius of the curves being 20 feet.

This machine is used for the disposal of the coke from the retorts. The hot coke is loaded in skips which contain from 14 to 16 cwt., and in these it is conveyed by the telpher machine to the tip, where it is quenched. The motors operating this machine are both of the "K.A." type. The hoisting motor is rated at 12 H.P., and is capable of lifting 35 cwt. at a speed of 65 to 70 feet per minute. The travelling motor is a duplicate of the one used on the coal-handling machine for the same purpose, and is capable of running the set at a speed of 550 feet per minute. The weight of coke handled by this machine per day of 24 hours is 100 tons; the plant being worked in two shifts of twelve hours each.



Telpher Equipment at Southampton Gas-Works—Tipping Coke.

In addition to the motors installed on these two machines, a 7½ H.P. "D.G. No. 6" type B.T.H. motor is in use for driving a Zimmer patent coke conveyor, which is used to transport the coke to the bunkers; the breeze, or very small coke, being removed during the process.

These motors have, it is reported, given complete satisfaction since their installation, and stand up to the maximum demands made upon them without the slightest overheating.

The photos show the two telpher machines here mentioned which were manufactured by Messrs. Strachan and Henshaw, Limited, of Bristol.

OIL AND GAS FROM BRICK EARTHS.

The current number of the "Builder" contains some extracts from an article on the above subject, by Mr. Guy P. Crowden, which appeared in "Oil News" some weeks ago. The scheme deals with the production of oil, gas, and ammonia from the bituminous matter contained in the Oxford clay which is used for brickmaking in the neighbourhood of Peterborough. These bricks are burnt in Hoffmann kilns at small expense, due to the fact that the raw bricks contain a quantity of bituminous matter; and the heat is therefore obtained in the kilns at a very low cost, and there is also a great deal of waste heat in the flue gases as they leave the brick-chamber.

Some tests were made at King's Dyke with an iron retort similar to those formerly used in gas-works. The retort was built into a chamber of a brick-kiln; the green bricks being stacked around and below it, so that it was heated by the burning bricks and hot gases. The oil and other volatile products were not removed at reduced pressure, nor was steam injected at any time to increase the yield of oil and ammonia. The following were mean results per 1000 bricks—*i.e.*, 3 tons by weight—obtained under these conditions: Temperature, black, dull red heat; oil (crude), 20 gallons; ammoniacal liquor, 80 gallons; gas, 1500 cubic feet.

Though the yield of oil per ton of bituminous Oxford clay is small compared with that from the bituminous Kimmeridge shale or Scottish oil shale, yet this disadvantage is counterbalanced by the following advantages of this method of production: (1) The cost of heat required for the destructive distillation of the bituminous matter is eliminated; (2) the residual product from the retorts is valuable, since it is in the form of bricks; and (3) the temperature of the retorts will rise gradually as the temperatures of their corresponding chambers rise. This is one of the conditions necessary for the maximum yield of oil, and for the manufacture of the best bricks.

It is thought that the adoption of this scheme will probably lead to economies in the brickmaking industry itself by employing the gas produced from the bricks either for power production in connection with the machinery, for lighting, or even for burning in the kilns instead of the small coal now used. If the gas is not used for power production in existing works, which already employ steam power or have producer-gas plants, it may be utilized as fuel in connection with the refining of the oil and in the recovery of the ammonia from the ammoniacal liquor.

The ideas put forward by Mrs. Cloudesley Brereton in a paper read last April before the Institute of Sanitary Engineers, on "Problems of Domestic Lighting, Heating, and Cooking from the Woman's Point of View," have been considered so sound that she was asked to read a paper on the same lines at the annual meeting of the Royal Sanitary Institute, of which she is a member. The conference is being held this week at Blackpool; and Mrs. Brereton will read her paper to-morrow (Wednesday).

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Meeting in Munich.

THE Fifty-Fifth Annual General Meeting of the Association was held last week, July 1, 2, and 3, in Munich. Although the members met there only two years ago, it was decided that this should be the *venue* again this year, to enable the members at the same time to visit the great gas exhibition, an account of the formal opening of which is given below. The official headquarters of the Association during the meeting were at the Hotel Bayerischer Hof, in a large and beautifully decorated hall of which were held the business meetings. The attendance, however, was so large that the size of the hall was scarcely adequate for the comfortable accommodation of all the members in the hot weather which favoured the opening day.

A BIRD'S EYE VIEW OF THE GERMAN ASSOCIATION MEETING.

By ONE WHO WAS THERE.

FIVE years older than the English Institution of Gas Engineers, but if anything more vigorous, the German Association of Gas and Water Engineers began their fifty-fifth annual gathering on Tuesday evening, the 30th ult. It was a sort of hand-shake before the conflict of discussion and the heat of debate to open on the following morning was entered upon. The scene was in the large hall of the Hackerbräukeller in the Theresienhöhe. Here, seated at tables for supper, were about 1400 of the members, their fair relatives and friends, and the visitors who had been honoured with an invitation to attend the meeting. The festival was given by the Municipality of Munich, on whose behalf Herr R. Panzer, a member of that body, offered words of hearty welcome. The President of the Association, Dr. F. Reese, responded. Seated at the principal table were Herr M. Hase, Herr K. Lempelius, Dr. Karl Bunte, the Secretary of the Association, Rechtsrat Dr. Wölzl and Herr Moriz Bühler, Herr W. von Cornides-Krempach, Herr Freidrich Edenhofer, Dr. Karl Kuhles, Herr Hans Ries, and Herr Rudolf Rosa, members of the Council. Herr Joseph Pschorr, the President of the Munich Gas Exhibition and of the Munich Chamber of Commerce, and, by the way, a maker of the famous Munich beer, was there. The Institution of Gas Engineers was officially represented by the President (Mr. John Bond, of Southport), the Honorary Secretary (Mr. W. E. Price), and the Secretary (Mr. Walter T. Dunn). Mr. A. E. Broadberry (Vice-President) was also present. Mr. William H. Bennett, of Redhill, Mr. R. W. Edwards, of Aldershot, Dr. Arthur H. Elliott, of New York, Mr. O. Pihl, of Christiana, Mr. B. Schieldrop, of Bergen, and Mr. R. T. Surtees, of Newton-le-Willows, formed the representation of the members of the Institution. Bailie Thomas Paxton, the President of the British Commercial Gas Association, and the Secretary, Mr. W. M. Mason, were to be seen; and among the prominent Continental gas engineers and chemists known by their visits to this country (noticed on Tuesday evening or during the week of the meeting) were Professor Geh.-Rat Hans Bunte, of Karlsruhe, Mr. Arthur F. P. Hayman, of Antwerp, Sig. Marcel de Jongh, of Rome, Mr. Henry Salomons, of Brussels, M. Ellisen, of Paris, Herr Heinrich Prenger (who was President of the German Association when its members visited England as guests of the Institution of Gas Engineers, during the presidency of Mr. Alexander Wilson, of Glasgow), Heer van Rossum du Chattel, of Amsterdam, Mr. O. S. Knottnerus, of Rotterdam, Dr. W. Leybold, of Hamburg, Mr. E. Körting, of Berlin, M. Henry Marquisan, of Paris, M. Bertin, of Caen, and M. Boutan (the President of the French Society of Gas Engineers).

A MERRY-MAKING OPENING.

The opening gathering partook of the nature of a jovial and merry-making festival, which is so dear to the heart of a German. There was an introductory ode spoken by girls, picturesquely dressed to represent various characters, with the typical Bavarian lady as the centre piece, to say nothing of her lion which created much amusement by its long drawn-out growls. The virtues of gas and the progress it had made in Bavaria were, of course, the main themes. During the service of the supper, there was the humorous vocalist chanting the sorrows of the German reservist; a double quartette men's glee party; an orchestra; Munich beer in litre mugs, with the lids always left open. Laughter and song permeated the evening. The Britishers nobly stuck to their posts, entering into the spirit of the gathering, which did not terminate till past midnight.

AT BUSINESS NEXT MORNING.

The business proceedings at the Bayerischer Hof (Bavarian Hotel) opened in the Promenadeplatz the following (Wednesday) morning. Some idea of the magnitude of the gathering may be obtained when it is stated that the printed list of names of those attending went up to 1334.

The President—Dr. Reese, of Dortmund—took the chair at nine o'clock. With him on the platform were Professor Bunte and his son, Dr. Karl Bunte, and the representatives from abroad, all of whom received a cordial welcome. In addition to others already mentioned there were present: M. Boutan, of Lyons (the President de la Société Technique de l'Industrie du Gaz en France), Mr. O. Pihl (the President of the Norwegian Association of Gas Engineers), Heer J. Blom (Haarlem), of the Dutch Association of Gas Engineers, Sig. Marcel de Jongh (Rome), of the Italian Association of Gas and Water Engineers, Mr. Weinberg (St. Petersburg), of the Russian Society of Water and Sanitary Engineers, M. Hubert de la Paulle (Brussels), of the Belgian Association of Gas Engineers, and Dr. Arthur H. Elliott, of the American Gas Institute.

After several introductory speeches, a paper on "The Present State of the German Gas Industry, and the Munich Gas Exhibition of 1914," by Herr Karl Lempelius (the "Goodenough" of Germany), was given the place of honour, as the first contribution to be presented. The next paper on the programme was by Professor Dr. M. von Gruber, of the Royal Privy Council and Medical Council of Munich, on the subject of "Gas and Hygiene." Then followed Mr. E. Körting, of Berlin, on "The Work of the German Gas Industry in Promoting the Good of the Community." Sir William H. Lindley, of Frankfort-on-Main, an Honorary Member of the Association, and well known in England as having been President of the Junior Institution of Engineers, was to have presented a communication on the "International Gas Thread Standards;" but he was unfortunately prevented from attending.

A DAY OF WATER.

The second session (Thursday) opened with a paper by Herr Kreutz, of Augsburg, on "Prussian Water Board Regulations in Connection with Town Water Supply." The next was by Herr Ernst Henle, of Munich, on "The Influence of Forests on Water Supply;" and this was followed by one on "The Removal of Manganese from Water," by Dr. Tillman, of Frankfort-on-Main." Herr Otto Vollmar, of Dresden, took as his subject "Removing Manganese from Artesian Well Water in the Elbe Valley, and the Dresden Plants Employed for the Purpose." "The Biological Results of Rapid Filtration at the Barmer Weir" was the title of a paper by Professor Kolkwitz, of Berlin; and "A Graphic Process for Measuring the Electric Drive of Pumps" was that by Herr M. Gaze, of Berlin, who is Chief Engineer to the Allgem. Elektrizitats-Gesellschaft.

A RETURN TO GAS.

The programme of the third session (Friday) consisted of a paper on "Questions Relating to the Price of Gas," by Herr Fritz Göhrum, of Stuttgart; a communication on "Gas Heating" from Dr. Karl Bunte, of Karlsruhe; and the presentation of the following reports: (*a*) "Gas-Meters;" (*b*) "Standard Threads;" (*c*) "Water-Works Management;" (*d*) "Educational and Experimental Institute;" (*e*) "Gas-Works Management;" (*f*) "Light Measurement;" (*g*) "Pipe Questions."

The concluding business comprised the annual report of the General Committee, the Simon Schiele donation, arrangements for 1914-15, and the election of President, Committees, and Commissions. The choice of the principal officer fell upon Dr. F. Reese, who will thus serve for a third year as President. The meeting next year will be held at Dortmund.

SIGHT-SEEING AND VISITS.

Excellent arrangements were provided during the week for the entertainment of the ladies, of whom there were a large number present. On Wednesday afternoon a tour embracing the principal places of interest for which fair Munich is so famed was carried out. The beautiful Hellabrunn deer park, which, in one translation of the programme, had on Wednesday afternoon not inappropriately become the "dear" park, was greatly admired. The Nymphenburg, the English garden, the Gasteigamlage, and various museums and picture galleries for which the town is celebrated were visited. In the German Museums—the South Kensington of London—members were attracted by the exhibits relating to foundry work, gas, electricity, and water supply, civil engineering, house building, public hygiene, heating, and refrigerating. Another section of this museum contains models and specimens bearing on mining and metallurgy, mechanics, transport, astronomy, physics, chemistry, watch-making, agriculture, river work, and shipping. The Technical High School in the Arcisstrasse was also open for inspection; and much interest was manifested in the new installation which was shown in the mechanical laboratory.

The Isaria gas-meter works, and the Dachauerstrasse works of the Gas Department of the Municipality of Munich were also visited. At the latter the members were conducted round by Dipl-Ing. Herr F. Pronnet and other officers of the Department. There were about 170 present at this visit, although it had been limited to 150, which showed the great interest taken in these model works. The works, which have already been described in the "JOURNAL,"* embody a fine example of a Munich chamber-oven installation. They have been designed with the artistic

* See Vol. CXXI., pp. 24, 91, 171.

taste, and constructed in the substantial manner, so characteristic of the Continental undertakings.

The Opening of the Exhibition.

The evening of Wednesday, July 1, will be memorable in the programme of the Association's Munich meeting of 1914; for it was then that the Gas Exhibition was formally opened with due ceremony. It was the intention of His Majesty King Ludwig III. to declare the exhibition open; but, in consequence of the dastardly crime which has plunged the Royal House into mourning, this was done by the Prime Minister, who was accompanied by the other members of the Cabinet.

Herr Pschorr, President of the Exhibition, and Geh.-Rat Dr. Bunte having spoken from the rostrum erected near the entrance, the Prime Minister, in a few words, on behalf of His Majesty, declared the exhibition open. The German National Air was played, and the Prime Minister, with his *entourage*, made a tour of the exhibition. In the beautiful hall of the Hauptrestaurant, they partook of refreshments with the officers of the Association and of the exhibition, and the representatives from abroad; the occasion affording the opportunity for a most enjoyable *reunion* of gas-engineering friends from Great Britain, France, Germany, Italy, Austria-Hungary, Denmark, Norway, Russia, Holland, and Belgium.

In regard to the tragic bereavement already referred to from which the Emperor of Austria and the Royal House of Bavaria particularly are suffering, a message, of which the following is a translation, was sent to His Majesty King Ludwig III. at his residence at Munich: "The Members of the German Association of Gas and Water Engineers who are assembled at the Bayerischer Hof at Munich offer to Your Majesty, after a very successful opening of the Gas Exhibition, their devoted thanks for the kindness Your Majesty has shown in becoming Patron of the Exhibition and thereby acknowledging the work which the Association is doing. They also offer to Your Majesty the expression of their profound condolence on the death of your nephew, and sympathy with Your Majesty and the Royal House in your affliction. They pray that God may save, protect, and bless Your Majesty and the Royal Family."

To this message a gracious reply was received, expressing His Majesty's regret at being unable to attend the opening ceremony, and hoping that the efforts of the Association might be continued with increasing and abiding success.

As to the exhibition itself, there was nothing but genuine and unstinted praise from everywhere. Indeed, it would be difficult to suggest in what way the display could have been improved upon. It must, however, be borne in mind that the buildings in which the exhibition is housed are permanent ones—the property of the Municipality of Munich—and specially erected for exhibition purposes. They are situated in the midst of charming gardens, beautifully laid out and kept; and so well managed is this piece of "municipal trading," that the place is regarded by the people as a fashionable resort, with the result that the advantages of the use of gas will be brought home in more senses than one to those the gas engineer is anxious to assist.

The promoters of the exhibition have been busy for the last year with their preparations. About a month before the opening, the work of installing the exhibits began; and at the moment of opening, absolutely everything was in its place ready for inspection. Of course, the German instinctive artistic touch was observable throughout the extensive halls, of which there are six. Incidentally, let it be said that a word of praise is due to those who compiled the catalogue. It is a model of what such productions should be. The writer learned from Herr Lempelius that he and his colleagues had been assisted in their work by what they saw at the British Gas Exhibition in October of last year. The examples of outdoor illumination are good. The eight gas flares of classic Greek design burning in the entrance platz were very effective indeed, and greatly admired. In a word, congratulations from all the engineers of the Fatherland, and all the representatives from abroad, were unstintingly bestowed, and none were louder in their praises than those from Old England.

A special visit was paid to the exhibition on Thursday afternoon when Herr Bosig, Engineer to the Exhibition, attended to explain the gas main and pipe sections which had been laid down. The exhibition is divided into the following sections: (1) Scientific and Historical; (2) Gas-Works Management; (3) Manufacture of Illuminating Gas; (4) Distribution, Measurement, and Installation; (5) Domestic Lighting, Street Lighting, and General Street Illumination; (6) Capacity of a Cubic Metre of Gas as regards Light, Heat, and Power; (7) Gas in the Kitchen, the Household, and in Schools; (8) Bath Water and Water Heating Generally; (9) Heating of Houses by Means of Gas; (10) Gas for Industrial Purposes; (11) Gas-Engines; (12) Gas in Connection with Air-Ships; (13) Treatment and Utilization of Bye-Products; (14) The Application of Gas for Industrial Purposes.

In the evening of Thursday, there was an informal gathering at the main restaurant of the exhibition; but the fine weather which until then had prevailed during the week broke down, and a heavy thunderstorm, which lasted from about seven till nine o'clock, somewhat reduced the attendance.

A Mammoth Banquet.

On Friday evening, at six o'clock, about 1700 ladies and gentlemen sat down to a splendidly arranged and served banquet at the Bayerischer Hof. All the rooms in this spacious hotel had to be brought into requisition; but so well was everything managed that each individual member of the great company was made happy and comfortable in every respect. Our German colleagues are to be heartily congratulated on the skill displayed in organizing and carrying through this mammoth entertainment.

Dr. F. Reese, the President, occupied the chair. Notable guests included Second Burgomaster Merkt, of Munich, the Rector of the University of Munich, Unter Staats Sekretär Mayer, the President of the Gas Exhibition (Herr Pschorr), Geh.-Rat Dr. Bunte, Dr. Karl Bunte, Herr Lempelius, Herr Direktor Hase, of Lubeck, and the respective Presidents of the kindred Gas Associations from abroad.

All the speeches were good and well delivered from a rostrum erected on a platform at the back of the President's seat. The President having proposed "The King of Bavaria and the Kaiser," which was loudly acclaimed, and accompanied by the singing of the National Anthem, Herr Direktor Hase gave "Munich and the Gas Exhibition." Herr Merkt then proposed "The German Association of Gas and Water Engineers;" that of "Industry, Technics, and Science" was given by Herr Pschorr; and Herr Lempelius, in a happy and laughable speech, submitted "The Ladies"—not overlooking the circumstance that "flambeau" may be interpreted both as "flame" and "sweetheart." Geh.-Rat. Dr. Bunte proposed the toast of "Our Friends from Abroad," which was feelingly acknowledged by M. Boutan (France), Sig. Marcel de Jongh (Italy), Mr. John Bond, President of the Institution of Gas Engineers (Great Britain), de Heer J. Blom (Holland), Mr. S. G. Weinberg, B.S.E.M. (Russia), and M. Hubert de la Paulle (Belgium). The concluding toast was that of "The Central Polytechnic" given by the Rector of Munich University. Then "dancing upstairs" was announced; and this was indulged in till the small hours of the morning. It was a glad scene this intermingling of all the nations; and it must, as Mr. Bond happily expressed it in his excellent speech, result in international good and industrial benefit to all.

The Last Day and Pleasant Memories.

Saturday broke with a heavy downpour of rain, which was steadily continuing at two o'clock, so that the writer fears the number attending the four excursions which had been arranged must have been reduced in consequence. The excursions were: (1) To the Starnberger See; (2) to the Royal Castle of Chiemsee; (3) the mountain tour to the Wendelstein; and (4) to the source of the water supply for Munich, and the Taubenberg.

Nothing but pleasant recollections will remain of the German Association's fifty-fifth meeting (at Munich). The reception accorded the British and other delegates was cordial in the extreme.

OPENING OF THE MEETING.

On Wednesday, July 1, the President, Herr Reese, of Dortmund, took his seat at 9.15, and was supported on the platform by the Secretary, Dr. K. Bunte, of Karlsruhe, and the members of the Council, Herren M. Hase, of Lübeck, and K. Lempelius, of Berlin. The attendance numbered some 1334. The President opened the proceedings by inviting the foreign representatives, a fair number of whom were present, to take seats on the platform. He next offered a hearty greeting to all, members and guests alike, and expressed his pleasure at seeing such a large and representative assembly. They were singularly fortunate, he said, in that this, the fifty-fifth meeting of the Association, coincided with the opening of the great gas exhibition, "Das Gas," which he hoped they would all thoroughly inspect and admire. At the same time they would hear with great regret that the royal patron of their industry, King Ludwig III. of Bavaria, would be unable to perform the opening ceremony, as he had promised to do, owing to the atrocious crime committed the previous Sunday, which had shocked the whole civilized world, and thrown all European courts into mourning. He asked the members, while expressing their deep sympathy with the King in his bereavement, to give three hearty cheers for him. A telegram expressing their homage was approved and dispatched.

Numerous speeches of welcome were then made, among others speaking being the Burgomaster of Munich, representatives of the Ministry, the Chamber of Commerce, the University, and other technical societies. The next speaker was Professor Strache, the President of the Austro-Hungarian Gas Association, to whom was entrusted the expression of gratitude of the eleven foreign nations which were represented in the assembly. Finally, the President thanked the various guests for their speeches and the kind feelings which one and all had expressed towards the German Association.

The next item concerned the giving of honours to three long-standing members. The first was Mr. W. L. Drory, of Frankfort-on-Main, who, the President announced, had been unanimously elected an Honorary Member of the Association. Then Dr. von Oechelhäuser, of Dessau, and Herr H. Ries, of Munich, received the distinction of the "Bunsen-Pettenkofer Tablet," the former for his well-known services to the industry, the latter mainly for his work in connection with chamber-ovens. Both returned thanks for the honour bestowed upon them.

The remaining item in the preliminary business was a sad one—a sympathetic reference by the President to the losses the Association had sustained by death during the year. This the members endorsed by rising in their places. After an announcement that Sir Wm. Lindley was unfortunately unable to be present and read the paper down in his name, and that Dr. von

Oechelhäuser would present one instead, attention was called to the papers on the *agenda*.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR 1913-1914.

The annual report of the Council of the Association opens with a reference to the wide-spread and lively interest which the gas exhibition at Munich has excited. This is exemplified in one direction by the fact that the exhibition is under the patronage of His Majesty King Ludwig III. of Bavaria, who intended to open it in person.

The development of this exhibition led the Association to change the place of this year's general meeting from Dortmund (which had been chosen last year) to Munich, in order to facilitate the visit of members of the Association to the exhibition. The City of Dortmund accepted the position with grace, and has invited the Association to meet there next year instead of this. Thus it has come about that the Association, which was entertained so munificently at Munich only two years ago, is again holding its general meeting in the capital of Southern Germany.

The exhibition has been organized by the "Central Gas Publicity Bureau" with the co-operation of the whole industry. The Association has assisted in many directions, and is exhibiting its publications—including volumes of statistics and reports on its "Instructional and Experimental Gas-Works," and on the "Effects of Vagrant Electric Currents."

The Association paid an organized visit to the International Building Trades Exhibition at Leipsic last September, in which over 150 members participated. Severa Committees of the Association utilized the occasion to hold sessions; and the general meeting of the Central Gas Publicity Bureau, a meeting of the Industrial Assurance Committee, and a session of the Commercial Association of German Gas-Works, were also held at the same time. The functions of these various bodies, all dealing in matters connected with the gas industry, have been discussed with a view to preventing overlapping of their activities. The conclusion is arrived at that the scope of each of the bodies is distinct. The objects of the Central Gas Publicity Bureau and of the Commercial Association of German Gas-Works require different organizations to that of the German Association of Gas and Water Engineers; so that it has not seemed possible that they should be directly connected with the latter body. Hence these distinct organizations have sprung up and must expand. There is no breaking-away from the Association, but merely an appropriate division of labour.

On the other hand, the Association has had to concern itself in the past year with new foundations, which would draw members from the same circles as it. These foundations do not deal with new problems requiring a fresh organization, but have arisen from the business aims or ambitions of their founders. New journals aspire to become the organs of an Association which is perhaps termed "International," whereas International Associations, if they are to have real influence, must depend on the leading National Associations, and must be formed in the first instance through their co-operation. The term "International" in such cases is generally superfluous, since technical and scientific matters are never subject to political limitations. From the point of view of the industry, such "Associations of Subscribers" are not welcome, as they lead only to the division of power and means.

In international deliberations proper, the Association has taken an active part in two Commissions—viz., the newly-formed International Commission on Illumination, and the International Commission on the Standardization of Screw-Threads. At the meeting in Berlin last August, at which the International Commission on Illumination was organized, the Association was represented by Professor Eitner, Dr. Krüss, Professor Drehschmidt, and Dr. Karl Bunte. The official representatives of Germany on the International Commission are appointed by co-operation of the Association with the Institution of German Electrical Engineers and the German Illuminating Engineering Society. The officers of the Commission, and the manner in which it is to be financed, are fully stated in the report. [These matters have already been reported upon in the "JOURNAL," Vol. CXXIII., p. 607.] The German Illuminating Engineering Society was not in a position to provide from its own funds the necessary contribution to the International Commission, with the travelling expenses of delegates to the sessions, amounting to about £450 for three years. The Institution of German Electrical Engineers and the German Association of Gas and Water Engineers have therefore guaranteed the necessary funds until the Illuminating Engineering Society is in a position to find them from its own resources. In order to make this Society financially independent, Professor H. Bunte, on behalf of the Association, and Herr Dettmar, the General Secretary of the Institution of German Electrical Engineers, approached corporate members and firms of the two bodies with a view to their increasing their annual contribution to the Society from 5 marks to 50 marks. The proposition has been favourably received by many corporations and firms; and, if their example is generally followed, the German Illuminating Engineering Society will have its financial position sufficiently strengthened to render the guarantee of the two Associations unnecessary. At the suggestion of the two Associations, the German Illuminating Engineering Society has nominated Herr Brodhun and Dr. Krüss as the representatives of Germany on the International Commission on Illumination.

The International Commission on the Standardization of Screw-Threads held a session in Paris on Nov. 17 and 18 last, at which Sir William Lindley represented the Association. He is to report directly to the present meeting as to the proceedings and the results attained; but it may be mentioned that the work of the Commission has led to decisions on the most important points which generally correspond with the desires of the German representatives.

During the past year the Association has participated in various deliberations on technical matters. The Union of German Architects and Engineers Associations brought forward, through a Committee, proposals as to the fees for architects and engineers. The first scheme proposed special fees for a large number of special branches of work, but did not include any special scales of fees for gas, water, and sewage schemes, although these important branches of engineering were not directly covered by any of the proposals. The activities of the Association extend to many branches of work for which the fees were under consideration, and to the groups comprising these branches representatives of the Association were appointed as follows: For town planning, including architects, municipal, tramway, and constructing engineers, Herr Lempelius; and for surveyors, water, bridge, and railway engineers, Herr Schröder, of Hamburg. At a session held on March 25 the Association was represented by Herr Heidenreich, who expressed the views of members of our special branch of industry. It was decided that the Association should contribute 100 marks annually towards the expenses of the Union.

The Union of German Architects and Engineers Associations also invited the Association to send a representative to a Committee dealing with the improvement of methods of arbitration; but, while expressing its interest in the question, the Association did not consider it necessary to send a representative.

The Committee on Units and Dimensions, to which the Association belongs, has issued during the year a number of suggestions of which the Council has taken notice. The scheme of distribution of the expenses of this Committee was, in the opinion of the Council, unfavourable to the Association, which has asked to be put on the same basis in regard to the Committee as in regard to the Committee on Fees for Architects and Engineers.

The Technical Instruction Committee—in the deliberations of which Herr Reese and Professor H. Bunte participated—has issued a summary on the matter, which has been published, and has asked the Affiliated Associations to draw the attention of their members to the report of the Committee, which has been published in the *Z*eitschrift des Vereines Deutscher Ingenieure, parts 19 and 20.

The German Municipal Congress last autumn applied to the Association for a list of experts competent to act as independent members of the Congress in technical matters. The Association replied that it would gladly co-operate with the Congress and would, when necessary, nominate suitable experts according to the requirements and locality of each case. In a few cases advantage has already been taken of this offer.

An Association for industrial pensions for merit—having for its object the collection of funds to be devoted to the granting of superannuation pensions to, or allowances to widows and children of, men who had rendered great services in applied science and industry—approached this Association for support. The Council was of opinion that these meritorious objects could be left to the support of voluntary subscriptions.

The "Electrolysis Prescriptions," having for their object the protection of gas and water mains from the injurious effects of continuous current systems, in which the rails are used as conductors, which were issued by the joint Electrolysis Committee in 1910, have not so far proved effective, because they had no legal authority. Great damage to water-mains has taken place in many districts—*e.g.*, the rural district of Aix-la-Chapelle—and the Association has, therefore, been impelled to take steps to make these prescriptions binding, or at least to have them incorporated in the Tramway Law. On Dec. 24 last the Association brought the matter before the Prussian Minister of Public Works in a petition in which it was represented that, in any change or extension of the law relating to electric tramways, provisions for the protection of gas and water mains from the injurious effects of vagrant currents from continuous current systems should be incorporated on the lines of the prescriptions of the Electrolysis Committee.

An official communication from the Bavarian Home Secretary's Department, on the erection and maintenance of lightning conductors, recommended in general terms the connection of lightning conductors to gas and water mains. This recommendation being contrary to the position taken up by the Association on the report of a Committee in the year 1889, the Association lodged a protest with the department concerned. The position of the Association in the matter is that the connection of lightning conductors to gas and water mains is neither necessary nor commendable on practical grounds, and if carried out at all should be done under special regulations.

In March, the Council learned that a Prussian Water Commission was being formed, and application was therefore made to the Minister of Agriculture, Woods, and Forests that the Association should be allowed to nominate a delegate on the Commission.

Two proclamations of the Imperial Chancellor, with reference to the extension of the Standards Law, and the changes and the extensions in the standardization of water-meters, led to correspondence with the Imperial Standards Commission. This matter is referred to in the report of the Committee on Water-

Works. It appears that only greater facility for standardizing meters, and not compulsory standardization, is contemplated.

A proposal of the German Pipe-Makers' Association for the extension of the standards for cast-iron pipes, which had been agreed upon by this Association and the Association of German Engineers, was brought before the two latter bodies by the Ministry of Public Works. The Association adopted the attitude that, while technical advances might admit of exceptions being made in certain cases, the old standards should in general be observed.

The Council has held six meetings in the course of the year—four being in Munich, one in Berlin, and one in Frankfort-on-Main. At the last-named meeting, Sir William Lindley was nominated as an Honorary Member of the Association. In addition to participating in the meetings of various kindred bodies, the Association took part in the International Gas Exhibition in London.

The heating of churches by gas was a subject of investigation on account of complaints that indicated that the installations had in some cases been carried out on improper lines. A circular issued by the General Secretary of the Association to all works which were known to have established gas-heating plants in churches showed that all the plants installed since the year 1900 were working quite satisfactorily, with three exceptions. Also, that the comparatively few older installations which did not fulfil the stringent requirements of the Association could readily be put in order.

A circular issued by the General Secretary of the Association to the water-works of German towns having a population of over 10,000 brought replies as to the quality of the water supply which are included in an appendix to the report of the Committee on Water-Works. The results will throw light on a whole series of questions, such as the effect of the hardness of water on the durability of gas water-heaters, the attack of soft water on mains, &c. All the works to which the inquiry was directed, with a few unimportant exceptions, have contributed to these statistics.

A number of towns were circularized at the instance of the Pipes Committee with regard to experiences with the supply of gas to consumers at pressures of 4 to 8 inches of water. The results of this inquiry are included in the report of the Pipes Committee. The same Committee has inquired of different works as to the colours and signs used in plans and drawings to indicate pipes and fittings; and the results of the inquiry are included in the Committee's report.

The Council thank the members of the Technical Committees, and the Chairmen in particular, for the valuable work which they have done in the past year. The reports which most of the Committees present to the meeting indicate clearly the extent and value of their work. [Abstracts of these reports will later on be given in the "JOURNAL;" and hence it is unnecessary to reproduce the references to them which occur in the report of the Council.]

The membership of the Association has decreased by 23, as compared with the previous year, owing to the effect of the increase of the subscription. The Association has, however, lost, through death, five members who have actively participated in its efforts for some years past—viz., Herr Julius Hasse, of Dresden; Professor Aron, of Charlottenburg; Mr. S. Simmelkjaer, of London; Herr A. Weiss, of Zürich; and Mr. E. Bentzen, of Copenhagen. At the close of the year the Association comprised 5 honorary members, 886 ordinary members (437 being personal and 449 corporate or impersonal members), and 183 associate members—making a total of 1074 members of all classes.

There are, as hitherto, eight affiliated District Associations, on the work of which during the past year summaries are given in the report.

The Brandenburg Association of Gas, Electricity, and Water Engineers held its 35th annual meeting in Berlin last March. The inclined chamber settings at the Tegel Municipal Gas-Works were inspected; also the Diesel engines for driving the pumps at the Berlin (Lichtenberg) Water-Works. The Association comprises 2 honorary members and 191 members. The President for the ensuing year is Herr Kümmel, of Charlottenburg. Several technical papers were presented at the meeting.

The Mid-Rhenish Association of Gas and Water Engineers held its 50th annual meeting at Kolmar in Alsace last September, under the chairmanship of Herr Göhrum, the Manager of the Stuttgart Gas-Works. At the conclusion of the year the Association comprised 7 honorary members, 116 ordinary members, and 149 associate members, which is a diminution of six in the total membership as compared with the previous year.

The Association of Gas and Water Engineers of Silesia-Lausitz held its 45th annual meeting last August at Hirschberg in Silesia. The papers read at the meeting included: (1) "Coke Oven Gas Supply to a Distance," by Dr. Witzek, of Cologne; (2) "High-Pressure Street Lighting, with Special Reference to Lowering and Suspension Devices for the Lamps," by Herr Wilhelm, of Charlottenburg; (3) "Statistics of Domestic Gas Consumption," by Herr F. Meurer, of Cossebaude; (4) "Gas and Electricity from the Popular Standpoint," by Herr Othmer, of Berlin; and (5) "On Heating Industrial Furnaces with Gas Coke," by Herr Büchner, of Cologne. The Association numbered at the time of the meeting 2 honorary members, 115 ordinary members, and 63 associate members.

The Association of Gas, Electricity, and Water Engineers of the Rhine Provinces and Westphalia held two meetings, one in September at Bonn, and one in February at Cologne. At the close of the year the Association comprised 3 honorary members, 256 ordinary members, and 124 associate members.

The Bavarian Association of Gas and Water Engineers held its 29th annual meeting at Bayreuth in April, under the chairmanship of Herr Geyer, of Augsburg. The Association comprises 4 honorary members, 87 ordinary members, and 91 associate members.

The Baltic Association of Gas and Water Engineers held its 41st annual meeting in September at Danzig, under the chairmanship of Herr Sorge, of Thorn. The Association comprises 1 honorary member and 174 other members.

The Association of Gas and Water Engineers of Saxony-Thuringia held its 61st general meeting at Schaudau on the Elbe in May, under the chairmanship of Herr Reinhard, of Leipzig. The membership comprises 114 ordinary and 68 associate members.

The Association of Gas and Water Engineers of Lower Saxony held its 15th annual meeting in August at Lüneberg, under the chairmanship of Herr Bock, of Hanover. The Association comprises 174 members.

The report gives a list of the corporations and firms which have contributed to the "Scientific Purposes Fund" of the Association during the year. It also gives the report of the "Schiele Fund" Committee which during the year has made a grant to Herr H. Koken, an Assistant at the Hanover Water-Works, towards the expenses of investigations on the humidity of the soil and the capillarity of underground water in the North German Plain. Reference is also made to the "Benevolent Fund" of the Association.

The report is signed by Herr F. Reese, the Manager of the Dortmund Corporation Gas-Works, as President; by Herr K. Lempelius, the Manager of the Central Gas Publicity Bureau of Berlin, and Herr Hase, the Manager of the Corporation Gas, Electricity, and Water-Works of Lübeck, as Vice-Presidents; and by Dr. Karl Bunte, of Karlsruhe, as General Secretary.

LECTURES AND PAPERS.

The first speaker was Herr Lempelius, of Berlin, who gave a short survey of the gas industry in Germany, and the *raison d'être* of the gas exhibition. There had, he said, never in one year been so many exhibitions as this year. Naturally the question had had to be considered, and had been a serious one for the organizers, whether it was necessary and wise to add this one to the number. The results, however, had fully justified the steps taken. The response of the industry had been such as to surprise even the boldest optimists, and the extent of the exhibits might be imagined when it was realized that they cover 18,000 square metres (over 4 acres); there being nothing which does not directly concern the gas industry. And the story of gas there was complete, from its manufacture to all its applications in home, factory, and elsewhere. In view of the extended account of the exhibition which will later on appear in the "JOURNAL," it is unnecessary here to give details of Herr Lempelius' survey of what is to be seen there. He remarked that, proud as they were of the technical development of the industry, they were prouder still of the commercial success attending it. In 1913 the number of new consumers obtained reached 60,000—nearly all prepayment meters. The Berlin Electricity Works, which had been in existence for 25 years, could only show a total of 42,310 consumers—far less than the number added in one year to the gas-mains. The spread of the use of gas to all classes of the people was a considerable step forward in the progress of civilization. It was to be hoped that the present exhibition would not be without its permanent effect, but that it would rather be a landmark in this progress of civilization; that, above all, it would increase the use of gas in many directions, and so work towards that most important end, the abolition of soot and smoke from cities and habitations.

The President briefly thanked Herr Lempelius for his interesting address, and then called upon Professor Dr. Max von Gruber to give his lecture on "Gas and Hygiene." Professor von Gruber proved a very able speaker, and, without reading from any manuscript, he wasted no time in presenting a large amount of interesting matter, illustrated by a number of diagrams and tables. It had, he explained, seemed desirable to examine and place on a scientific basis the effect of gas lighting on the air and the ventilation of dwelling rooms. Through the generosity of the Association, the Munich Hygienic Institute had been enabled to undertake the investigations, and the speaker wished first to place on record his gratitude. Whereas the Association in 1904 had studied the question of schools and drawing offices, and had laid down the conditions under which their lighting by gas can be considered hygienically perfect, an attempt had now been made to examine in the same way the small rooms of dwellings and offices, which concern the largest proportion of the population. The conditions under which the experiments had been made resembled as nearly as possible those of actual life. In general it may be stated that the investigations had gone to prove that many theories hitherto respected were quite without foundation. For instance, it had been shown that even after gas had been burning in considerable quantities for several hours, no trace of sulphurous acid was to be found in the air of the room. Likewise, even with the most sensitive tests they had never succeeded in finding carbon monoxide in the combustion products of incandescent burners. Another interesting observation was that, when gas was allowed to burn for long periods, there was no

unlimited increase in the carbon dioxide content and temperature of the air, but both quickly reached a stationary maximum, provided, of course, external conditions were unaltered. In all, Professor von Gruber has been able to establish 25 definite facts in connection with the subject of his investigations; and the success which has attended his work is yet another proof of the skill which has brought him to the prominent position that he holds among scientific men.

After a few remarks on the paper by Dr. Hans Bunte (Karlsruhe), Herr Jöhrum (Stuttgart), and Herr Schomburg (Gelsenkirchen), and a brief reply by Professor von Gruber, the President thanked the latter heartily for the good work he had done for the Association, and for the most interesting communication he had given them.

Herr Ernst Körting (Berlin) was then called upon to read his paper on "Efforts for the Common Good in the German Gas Industry." He said that he had always been a merciful man, and that, as the hour was getting near that was named in the programme for the luncheon adjournment, he would refer members to the Technical Press, rather than detain them long. The gist of the paper is as follows: It is now nearly two generations since gas-works managers stayed at home in their works, and whether affairs went well or badly, they acted on the principle of each for himself, and God for us all. Then, in the time of our grandfathers and fathers, the first combination was made, by the founding of the German Association of Gas and Water Engineers. In more modern times, three further efforts had been made at co-operation in the industry, by the formation of the Gas Publicity Centre, the Commercial Union of German Gas-Works, and the Training and Experimental Gas-Works at Karlsruhe. Dealing with the Publicity Centre (which corresponds to our "B.C.G.A."), Herr Körting explained the useful work it is doing, and said that it must continue to be supported to an ever-increasing extent by contributions from all gas undertakings. The "Wirtschaftliche Vereinigung" was also of great importance, as taking care of the residual products of the industry. The paper concludes with an appreciation of the excellent services which Dr. Bunte is rendering to the scientific side of the industry at Karlsruhe. Not the least important part of the work done there is the analyzing of coal; and when it is considered how many millions are spent on coal each year, the value of the work cannot fail to be appreciated. The efforts of Dr. Bunte should teach them to work out coal analyses in money values, and so it often turns out that the cheapest-priced coals are really the most expensive. This institution also, Herr Körting remarks, is deserving of continued material support, in view of the services it is rendering, and is always willing to render where possible, to the gas industry. [A full translation of the paper appears on pp. 29-30.]

WATER DAY.

As is the custom, the second day of the meeting was devoted solely to water matters. At the beginning of the proceedings, however, the President was able to announce that a telegram had been received from King Ludwig, in reply to that sent to him on the previous day. In it he expressed his sincere regret at having been unable to open the exhibition in person, but he hoped in the near future to be able to visit it. Without delay, Herr Kreutz, of Berlin, was called upon to read his paper on "The Importance of the Prussian Water Law for the Supply of Towns." Herr E. Henle supplied the next item with a paper on "The Influence of Forests on Water Supply." Other papers were "The Freeing of Drinking Water from Manganese," by Dr. Tillmans, of Frankfort-on-Main; "The Freeing from Manganese of the Underground Water in the Elbe Valley," by Herr Vollmar, of Dresden; "The Biological Results of Rapid Filtration at the Barmen Valley Dam," by Professor Kolkwitz, of Berlin; and "A Graphical Method of Estimating the Value of the Electrical Working of Pumps," by Herr M. Gaze, of Berlin.

PAPERS ON FRIDAY.

Gas-Engines.

The proceedings on Friday opened with the paper by Dr. W. von Oechelhäuser, on "The History of the Large Gas-Engine;" a subject to which the eminent engineer has devoted much time in the last twenty years. When the Electricity Central was erected in Dessau in 1886, Dr. von Oechelhäuser endeavoured to combat the new competition of electricity with the old-established gas industry, by using only gas-engines for the generation of power. But at that time the largest of them were only capable of giving 60 H.P. Naturally, much more than this was necessary for large electricity stations. The author next endeavoured, by means of an experimental apparatus, to discover the principles underlying the combustion of gas and air mixtures in unlimited quantities. Success attended these efforts in the shape of a gas-injecting process, which he called "dynamic" combustion, in contrast to the former "static" combustion of still gas. At the same time electrical means were adopted for the ignition of the mixture, in place of the flame ignition which had hitherto been general. This made possible the use of poor gas mixtures at high pressure. The results were then combined with the two-stroke gas-engine of Benz, which was at the time the best known, and which seemed to offer the most hope of an engine of high-power with as small cylinders as possible. For the further pursuit of his studies on the subject, Dr. Oechelhäuser joined forces with Hugo Junkers, who was best known as Professor of the Technical University of Aix-la-Chapelle, and in 1890 they founded their joint gas-engine experimental station in Dessau. The work on the Benz engine did not lead to the desired results; so in 1892 they determined, without following any known pattern, to build a 100-H.P. double-cylinder two-stroke engine. In several directions this marked a distinct advance in gas-engine technique. Compression and combustion pressure were brought to a hitherto unknown point—19 and 68 atmospheres respectively. The cylinder diameter was only about one-and-a-half times that of the four-stroke engines of the time, and the gas consumption was considerably less. When the Dessau Experimental Station was given up in 1893, the engine was transferred to the Bamag Company, and under their care 190 H.P. was attained in one cylinder. At this point the highest possible efficiency for continuous working seemed to have been reached, and still the power was not high enough for application to the generation of electricity in the largest stations. In the meantime, incandescent lighting had begun its victorious career, and had made gas so valuable that a material reduction in price—one of the essentials of the application of gas on industrial scales—was for the time being out of the question. In the year 1896, the author again turned his attention to the development of the gas-engine, when Ludwig Löwe suggested the use of blast-furnace gas, which had hitherto been used, in an uneconomical manner, for the heating of boilers. The early trials of the old 180 H.P. gas-engine using blast-furnace gas were most promising. When the author showed his plans for the alteration of the engine, with new details of working to suit the new gas, to the Hörde Colliery and Iron-Works Company, the latter made a bold move, and promptly ordered from the Bamag Company three large engines of 600 H.P. each, though as yet no model of the new construction was in existence, and no other system had succeeded in generating more than 180 H.P. On May 12, 1898, the first high-power gas-engine was set to work in Hörde. The technical and economical importance of this machine can be gathered from the estimate of Herr F. W. Lührmann, an eminent civil engineer of Osnabrück, that there is by its use a saving of Mk. 0·3 on each ton of crude iron produced, which would mean a total saving of 58 million marks [more than £2,800,000] for Germany in 1913. The largest engine of all, which was built by the firm of C. Borsig in 1904 for 1800 H.P. in one cylinder, was erected at the English works of the firm, where it is still working with success. Even to-day this capacity is not exceeded; indeed, these large units have been to a large extent superseded by the steam-turbine, with its large units. Dr. von Oechelhäuser concluded by declaring that he had ended his work in quite a different direction to that on which he had set out at the beginning. When electrical competition was first felt, he had endeavoured to discover new spheres of usefulness for gas, and to a large extent this want had been supplied by the iron and steel industries.

This paper evoked no discussion; and after an expression of thanks by the President to Dr. von Oechelhäuser for his contribution, Herr F. Göhrum, of Stuttgart, was called upon to read his paper on

Gas Charges to Consumers.

The author first considered the principles on which the selling price of gas should be settled, among others being the cost of gas to the undertaking and a consideration of successful propaganda work. The means of reckoning which was in common use until recently—*i.e.*, dividing the year's expenditure by the gas production—works well for controlling purposes if sufficiently specialized. But for fixing prices of gas used for special purposes something more than this is needed. For many purposes it will be found advisable to divide the initial cost of gas into fixed and variable costs; the distinction being whether or not the cost is raised by an increase in production outside the hour of maximum load. The author pointed out that the initial cost of gas supplied to individual districts must bear a definite proportion to the previously reckoned costs, and he warned his hearers against too optimistic estimation of the initial cost in endeavouring to increase sales, for, after all, the dividend paid must be the true criterion. Referring to the form of the tariff, and its great influence on propaganda work, Herr Göhrum laid down as the first essential a variable scale of charges. But the cost of the gas to the undertaking must not be unduly increased by complicated reckoning and book-keeping at the office. By several examples it was shown how a wise scale of charges can be used so as to help propaganda work. Frequent changes in gas price are liable to make the consumer uneasy, but they have the advantage that they keep him interested. The author then turned his attention to the question of obtaining new consumers and districts. In the first line he places room-heating by gas, then bread-baking, church heating, and industrial applications in general. In conclusion, the author emphasized the fact that a reliable opinion cannot be formed of any scale of charges until it has been working some few years, when the gas undertaking should be in a position to reconsider it with a view to making improvements.

Contributors to the discussion were Herr L. Schomburg (Gelsenkirchen), Herr Brandt (Bremen), Herr Lempelius (Berlin), Herr Schaeffer (Dessau), and Herr Ruoff (Kattowitz). Herr Schomburg, who spoke for almost as long as the reader of the paper, and illustrated his remarks with six diagrams, was heartily applauded by the members for an interesting contribution to the proceedings. Herr Lempelius in a short speech ably summed up the main points which had been made. One was that it is of first importance to find out what is the cost of the gas supplied in each individual case. The other that, when this cost is known, it is

necessary to decide how much profit is to be made. This must be limited absolutely by what the consumer is able and willing to pay beyond the cost to the gas-works. Herr Schaeffer traced the history of gas charges in Germany, pointing out that the country had had a system of dual charges (lighting and heating) in use since 1876, while England had remained faithful to the system of uniform charges to this day.

Gas Heating.

The last paper was one by Dr. Karl Bunte, of Karlsruhe, in which he explained the principal points on which the value of a gas-fire is to be judged. It is no longer the efficiency of gas-fires, he stated, which is the chief point of interest to the industry, since they have already been brought to an efficiency of 85 to 95 per cent. It is rather the satisfying of æsthetic, hygienic, and practical demands which should be aimed at. It is beyond all doubt that gas is an ideal heating agent, and its cleanliness, easy application, complete combustion without smoke and soot, have already ensured it a place in the kitchen, and for inter-heating purposes. If only gas-fires could be submitted to some test, and those rejected from the market which fail to come up to the standard approved by the industry, then the public would also be forced to give up the idea that gas heating must in any case cause a bad smell, and that to be a thing of beauty it must be a high-priced luxury. In London, explained Dr. Bunte, there are at the present moment about one-and-a-half million gas-fires in use, and the increase in one year was 10,000. Doctors and hygienists there are alike interested in them, and gas heating is an important factor in the purification of the atmosphere of London. But the modern gas-fire there is subjected to a strict test, so that no products of combustion are allowed to pass into the room, and that the combustion leads only to carbon dioxide and water vapour, and so is quite hygienic. With gas at 8 to 10 pf. per cubic metre [2s. 4d. to 2s. 10d. per 1000 cubic feet], gas heating can be done quite as cheaply as central heating. However, from a national economical point of view, explains the author, it is wiser in the darkest and coldest time of the year to take the main portion of the heat units which gas-works have to offer in the form of coke, rather than increase the price of gas by raising the capital charges on large plant which is only required for the maximum production of a few weeks. But for temporary heating of rooms which are not often in use the gas-fire may be placed before all other systems. If only economical, technical, and hygienic difficulties can be overcome, there is room for the gas-fire on all sides. But above all, strict observance is necessary, to prevent imperfect constructions being put on the market, which are capable of doing a large amount of harm.

Herr M. Hase (Lübeck), at the end of the paper, appealed for support for the Training and Experimental Institute at Karlsruhe, and Herr Schomburg once again offered some remarks on the subject under discussion. In considering Dr. Bunte's paper, it must not be forgotten that the gas-fire in common use in Germany is of the reflector type; the English pillar-fuel fire being seen only rarely.

REPORTS OF COMMISSIONS.

The papers being finished, the reports of the various Technical Commissions were presented with short explanations by a member of each. An abstract of one of these reports is to be found on p. 29.

ELECTION OF OFFICERS.

Herr F. Reese was then unanimously elected President for the third year in succession, and it was announced that next year's meeting will be held at Dortmund, where he is Manager of the municipal water-works. Herren M. Hase (Lübeck) and E. Körting (Berlin) were appointed to vacancies on the Committee. A vote of thanks to the President was then passed, and he declared the business of the meeting at an end, thanking the members for their patience during the hot weather which attended all three days, and hoping to see them all again next year in Dortmund.

[Our report of the later proceedings is, unfortunately, not to hand at the time of going to press.]

SYNTHETIC PREPARATION OF COAL GAS.

The "Comptes Rendus" of the French Academy of Sciences for the 15th ult. contained an article by M. Leo Vignon on the subject of the synthetic preparation of coal gas. As readers of the "Journal" are aware, the author has carried out a number of investigations bearing upon the properties of coal and similar matters. The following translation of the article may therefore be of interest.

We are aware that it is possible to gasify the total carbon in coal or coke by the preparation of air gas (producer or poor gas) or water gas. These two gases, however, present numerous inconveniences compared with coal gas. They are poisonous, and have but slight heating power, as shown by the following figures:

	Per Cent.	Average Calorific Power per Cubic Metre.
Coal gas	8	5000 to 5200
Air ,,	33	900 ,, 1000
Water ,,	50	2400 ,, 2800

I proposed to prepare synthetically by the total gasification of the carbon of coal, a combustible gas fulfilling the following conditions: (1) Containing as low as possible percentage of carbon monoxide, less than, or at most equal to, the percentage in coal gas. (2) Having the greatest possible calorific power, approaching that of coal gas. (3) Having an analogous composition to that of coal gas (hydrogen and hydrogen carbides). I was able to obtain these results by first of all solving a certain number of theoretical problems. I noted that carbon monoxide acting upon lime in presence of water, in specified conditions, was transformed into hydrogen carbides and carbonic acid. Next, a study of the action of steam upon carbon in the presence of lime enabled me to observe that the following reactions could be obtained from 600° to 800° C.:

$$(1)\ C + CaO + 2\,(H_2O) = CO_3Ca + 2\,(H_2);$$
$$(2)\ C + CaO + 2\,(H_2O) = CO_3Ca + CH_4;$$
$$(3)\ C + CaO + 2\,(H_2O) = CO_3Ca + C_2H_4.$$

My researches were then directed to the composition of water gas. The small proportions of methane it contains originate in the catalytic action of the lime on the coke. Other substances than lime can act catalytically for the formation of methane—*i.e.*, iron, nickel, copper, silica, alumina, and magnesia.

The results summarized allow of the synthetic preparation of a gas resembling coal gas. Several technical variants can be applied.

(1) Water gas brought into contact with lime, in presence of a suitable quantity of water, at about 400° C., gives a gas containing an average of 85 to 90 per cent. of hydrogen, 5 to 10 per cent. of methane, and 0·5 per cent. of carbon monoxide; its heating power being about 3000 calories per cubic metre.

(2) Steam is passed over a mixture of coke and lime heated to 600° to 1000° C., with the following reaction:

$$(4)\ C + 6\,H_2O = 3\,CO_2 + 4\,H_2 + CH_4$$

Supposing the carbonic acid to have been separated, 100 kilos. of coke give 200 to 230 cubic metres (7000 to 8000 cubic feet) of gas having the following percentage composition: Hydrogen, 80 to 85; methane, 15 to 20; carbon monoxide, 0·5. The heating power is from 3500 to 4000 calories per cubic metre.

(3) Coal is mixed with lime and carbonized at 900° to 950° C.; and the result is 25 cubic centimetres of rich gas (A) per 100 kilos. of coal. This gas is very rich in hydrogen carbides and ammonia. Carbonization being ended, a current of steam, without excess, is conveyed on to the coke, maintained at 900° to 1000° C. Thus there is obtained altogether, per 100 kilos. of coal, about 200 cubic metres of gas (including gas A), the percentage composition of which, calculated after the deduction of carbonic acid, will be: Hydrogen, 70 to 78; methane, 15 to 20; carbon monoxide, 5 to 10. By suitable regulation of the reaction, the carbon monoxide can be reduced and brought to zero. The heating power, measured with a Junkers calorimeter, varies from 4000 to 4500 calories.

The quantity of ammonia which is carried forward by the gas, and which can be collected, is at least quadruple that usually found, and represents 36 kilos. of sulphate of ammonia per metric ton of coal. It may be supposed that the sulphate formed should be near the theoretical quantity; and 4·7 kilos. corresponding to 1 kilo. of nitrogen, we should have 47 kilos. per metric ton of coal with 1 per cent. of nitrogen, and 94 kilos. per ton with 2 per cent. of nitrogen.

Summary.—The synthetic preparation of coal gas presents, as compared with the old method, the following advantages: (1) It utilizes the raw material (coal) better and more scientifically. The volume of gas obtained is from eight to ten times greater than that of gas manufactured by simple distillation; and the main part of the nitrogen in the coal is transformed into ammonia. (2) It allows of the production of a gas which is not poisonous, and in which the proportion of carbon monoxide can be reduced to zero.

Ignition of Gas by Sparks.—Referring to Professor W. M. Thornton's experiments on the limiting voltages and currents below which the ignition of gaseous mixtures cannot be affected, Dr. J. Mennier writes to the "Colliery Guardian" stating that, according to researches by himself and Professor Couriot, the size of the wires has considerable influence on the igniting power of the spark, fine wires enabling ignition to be effected with smaller currents. With silver wires 0·1 mm. diameter they ignited a mixture containing 9·5 per cent. of methane with an almost invisible spark.

German Burgomasters at Granton.—The party of German Burgomasters who are touring Scotland have been motored to the Granton Gas-Works by the Lord Provost and Bailie M'Michael (Convener of the Finance and Law Committee of the Edinburgh and Leith Gas Commissioners), and were then taken through the works, where they were shown the inclined retort-house, and saw several retorts drawn and the coke conveyed, under the quenching apparatus, and thence to the screens and loaded into trucks. They also examined the workshops and canteen, and were much interested in the runway gear for carrying the food to the various tables. The party includes seven representatives from Berlin, four from Charlottenburg, three from Dresden, one from Frankfort-on-Maine, two from Hanover, two from Königsberg, three from Munich, two from Nurnberg, and one each from Stettin, Stuttgart, Bremen, and Lubeck.

THE GERMAN ASSOCIATION GAS-METER COMMITTEE'S REPORT.

The report of this Committee for the past year—signed by Herr C. Kohn, as Chairman, and Herr W. Eisele, as Secretary—states that the work of the Committee has been similar to that of the previous year. Among the questions put to the Committee by various undertakings, several referred to the difference between the registration of consumers' meters and of the station-meter. Opportunity was taken to point out that the German Meter-Testing Offices allow a margin of ± 2 per cent. in consumers' meters, and this allowance is apt to cause a difference between the records of station-meters and consumers' meters.

The Committee have continued their investigations on the production of a practicable artificial membrane for the bellows of meters. The last report stated that the 1910 membrane had proved completely tight to gas in the trial meters which had been fitted with it, but that moisture had caused a slight shrinkage of the material, with the result that the meters registered fast. A second membrane, known as 1912 G, had been found to withstand the effects of moisture, and trials made with it in various gas-works and at the Standards Office had shown it to be very promising. These expectations have been confirmed in a gratifying manner during the past year. The trial meters fitted with this membrane are recording accurately—as shown in tabular statements attached to the report. With trifling exceptions, the records have been extremely good throughout the year both when checked in practical use against control meters and when re-standardized. This membrane which has given such satisfactory results has been produced after long and careful experiments by the Gas Meter Committee working in conjunction with the Imperial Standards Department. An account of these experiments has been given earlier in the annual reports. The production of a practicable gas-tight material for meters is of value not merely for this purpose, but also in the manufacture of governors and distance-lighting appliances. Perhaps also it may prove useful as a balloon fabric.

Attention is also drawn to a membrane of a specially interesting character, which has been recently produced by impregnating more or less a fabric under the action of particular bacteria. This method of manufacture—it is the property of the German Incandescent Light Company—produces a membrane which is unaffected by ammonia, benzol, sulphuretted hydrogen, &c., but swells up slightly in pure alcohol.

The Committee are of opinion that the further development of the production of a gas-tight artificial material for gas-meter bellows may be left to the enterprise of industrial concerns.

Another matter which has been referred to the Committee by the Association is the standardization of the sizes of gas-meters. This question has practically resolved itself into the standardization of gas-meter unions. It seems desirable to leave the meter makers a free hand within wide limits in regard to the dimensions of the meter casings and the internal construction of the meters. The standardization which the Committee now aim at is limited to the following items:

(*a*) Uniformity of meter unions. After deliberation with a firm of makers of unions and a report of the meter makers, the Committee finally decided to recommend as standard unions those already adopted for water-meters with, if necessary, thinner walls.

(*b*) Uniformity of the sockets of wet gas-meters. The important dimensions are the height of the inlet and outlet sockets above the face of the meter, the distance apart of the sockets, and the depth from the wall. It was found that with wet meters of different origin, the important dimensions did not deviate very greatly; so that unification on the best of the Berlin dimensions seemed to be practicable. The fixing of the distance from the wall makes it possible to vary the depth of the meter within wide limits. The deeper meters would then only come closer to the wall and the shallower ones farther from it.

(*c*) Uniformity of the sockets of dry meters. It was in this case only necessary to fix the height of the sockets, their distance apart, and the distance from the wall of the inlets and outlets. The differences in the dimensions of dry meters cause considerably greater difficulties than in the case of wet meters; but it should be possible to establish standards. The Committee worked out tables and submitted them to the Association of Meter Makers for trial and amplification. It would be premature to publish the tables at present.

The latest proposals of the Committee having been generally accepted by the Association of Gas-Meter Makers at their last session at the end of April in Berlin, it only remains to point out that the adoption of such standards would, from the makers' standpoint, constitute a considerable advance and a great simplification of work. The adoption of standard threads for unions is eminently desirable. This stage having been reached, it rests not merely with the meter makers to undertake to work to the standards, but with gas-works to use only meters of the standard dimensions.

The work of the Committee in this direction appears to have been now accomplished; but since other questions arise which are referred to them from time to time, their re-appointment is recommended, and a grant of £20 for expenses in the ensuing year is asked for.

EFFORTS FOR THE PUBLIC GOOD IN THE GERMAN GAS INDUSTRY.

By Ernst Körting, of Berlin.

[Abstract Translation of a Paper read before the German Association of Gas and Water Engineers, Munich Meeting.]

A few months ago the Shakespeare Jubilee was creating considerable stir in German papers. There was talk in them of how the spirit of the Renaissance had been embodied in him as in no other poet or philosopher of that age of unrestrained individualism. It is well recognized also that Shakespeare is the most popular dramatic poet in Germany; for the London theatre-manager, Beerbohm Tree, has said that it is with Shakespeare as with Heligoland—what was British has now become a German possession. The author remembers in his earliest youth how his father used to declaim Othello and Coriolanus in the evening. It was, therefore, doubly novel and interesting to gather on the occasion of the Jubilee that there were modernists who were quite out of sympathy with Shakespeare. They were philosophers who had absorbed in flesh and blood the social efforts of the day, which require imperatively that the power of the individual should be subordinated to the commonweal. Most gas men have probably not yet reached this stage. They rather kick against the pricks; but all the same they cannot deny that they also participate strongly in the general development. It is now almost a couple of generations past that gas managers sat in their works and plied their craft, well or badly, in great freedom according to the rule "Everyone for himself and God for us all." The first coalition took place among our grandfathers and fathers when the German Association of Gas and Water Engineers was founded. It was very feeble at first; but becoming closer and closer, the craft developed under the auspices of the Association into a scientific art. In our own time the rate of development has become more rapid. Our contemporaries have three new coalitions, three new special Associations—viz., the Central Gas Publicity Bureau, the Commercial Association of German Gas-Works, and the Instructional and Experimental Gas-Works. The author asks the attention of his colleagues with the desire to interest the Shakespeare natures among them more than hitherto in these joint efforts.

Beginning with the Central Gas Publicity Bureau, which originated with Herr W. von Oechelhaeuser (one of the Honorary Members of the Association), the great gas exhibition now open at Munich is due to its co-operative efforts. All will agree that in connection with exhibitions the work of the Bureau has been of a most exemplary character from its foundation onwards. But this is but a small part of its work.

Consider the position of the gas industry. Electricians have put the half-watt lamp for high candle powers on the market though without very striking results so far; and they are now busy in solving the same problem in regard to small lamps. The resources of modern electro-technics leave it without doubt that the difficulties which still remain will sooner or later be overcome, and then the electrical industry will be in the same position as the gas industry was on the introduction of the Welsbach light. The small individual consumption of current must influence unfavourably the output of current, and, consequently, there will be a double incentive to attract new consumers to the detriment of gas lighting. When this occurs, efforts must naturally be made towards expansion in the field of heating, in which electrical competition is not to be feared. Gas men must force their gas-fires into innumerable special industries. They must make it plain to well-to-do people that there is but one mode of heating worth consideration—viz., heating by the radiant heat of the gas-fire. The author would especially ask his hearers to regard carefully the numerous gas-fires which his Company has put in the exhibition, and to join in the propaganda for this method of heating. In particular, he draws attention to the incandescent fuel type of gas-fire combined with the tiled stove, by which a better utilization of the heat is secured, or combined with briquette or coke stoves. It depends on these efforts whether the gas industry extends beyond its present boundaries, or whether it recedes. Vigorous advertisement must be pursued. According to a first-rate business man, advertisement must be repeated again and again. It must reach as many people as possible, and must be quite short—preferably a catch-word or phrase. In this respect the old "Cook by Gas" was very good.

It must be our object in the next few years to ensure by advertisement that when people are cold they will turn involuntarily to the gas-fire, just as now cleaning the teeth carries with it the suggestion of "Odol." In the same way with the conception of a comfortable living-room a radiant gas-fire will involuntarily come before the eyes. The business man already quoted, when asked as to expenditure, said that a start must be made in Berlin with about £3000 for posters for railway stations, tramlines, &c., and the next year this amount should be doubled.

Probably he was not far wrong; and if great results are to be expected from the Publicity Bureau, means must be provided it

for advertisement on a grand scale. Obviously, the Bureau cannot undertake local advertisements in every town—each gas-works must see to that. But in the author's view, it can insert large, striking, and artistic advertisements in some of the great newspapers and a number of weekly magazines, &c., including the chief architectural journals. For this purpose, probably £5000 more than formerly is required, and the author would ask his hearers to impress on their authorities the imperative necessity of subscribing this sum. Once the Gas Publicity Bureau is put in a position to institute a campaign of intelligent advertisement and to pursue it, better results than are now anticipated will almost certainly ensue. The amount in question is small by comparison with the commercial position of the gas industry.

The second great organization—the Commercial Association of German Gas-Works—also calls for a sacrifice, though of a mental kind. It is no more nor less than that the Shakespeare nature in you must be completely put on one side when it comes to disposing of the bye-products. Things must no longer be regarded from the standpoint of a single community, but from that of the commonweal, or even of international polity. It is undeniable that formerly the gas manager was happy if he could congratulate himself on having found a good market for his coke and tar; but with the present means of transport, this independence of the individual must come to an end. Recently Westphalian coal has even competed with English coal in London; and having regard to the great competition of oven coke, on the one hand, and of brown-coal briquettes on the other, it is obvious that gas-works must combine with three objects: (1) To secure proper distribution of the whole production at home and abroad in order to prevent great fluctuations in prices. (2) For sensible propaganda. In regard to this, attention may be drawn to the formation of a Technical Coke Centre, for which the Rhenish-Westphalian Coal Syndicate and the Upper Silesian Economic Union have been jointly responsible. Its object is to repel the invasion of brown-coal briquettes for heating purposes by instituting propaganda by word and by the Press, and by carrying out trustworthy technical investigations. This is a worthy undertaking of a technical commercial character, as essential as a scientific institute like the Association's Instructional and Experimental Gas-Works, but dealing with other matters. (3) To secure solidarity in the fundamental views on economics, which, when once attained, will react abroad.

In illustration of the last point, some adjacent countries which import large quantities of coke form excellent safety-valves for the German and English coke trade. Firms who erect ovens come along, however, and, in order to secure a large order, demonstrate on paper to gas-works there the advantages they would gain if they used coal gas instead of coke for heating and produced three times as much coke. Now if German gas engineers had regarded German interests as a whole, they would have shown that the community which has to import coke is in a fortunate position, and should on no account erect ovens in order to reverse it. They would have used all their industrial weight to dissuade their friends abroad from a step which would be injurious to ourselves and would be of no lasting benefit to them, because any considerable increase in the production of coke is always accompanied by a great fall in its price.

One word in regard to the outcry against trusts. What is the feature of a trust? Obviously a limitation of production in order to effect an increase of prices. The reverse condition occurs in the gas industry, for the production of coke depends on the quantity of gas made. The Economic Union is concerned only with a rational distribution of the coke produced, and is no trust.

A classic instance of the efficacy of Sales' Associations for a whole country is presented by the ammonia market recently. Had there not been the large sales organization of the iron industry to cope with the Baden Aniline and Soda Works and force it to limit its output to a reasonable extent, the bottom would have been knocked out of the sulphate market, and German towns would have suffered a loss of many million marks in the year. It is right that the cost of ammonia propaganda should be partly defrayed by gas-works to the welfare of the whole people. Why are so much greater returns obtained in Germany than in France or Austria, which enjoy the same protective tariff? The author would ask his colleagues and municipal officers not to adopt a scornful attitude in such matters. It is natural indeed that they should only tardily grow accustomed to regarding things from the commercial point of view. We have learned that we must now before everything be commercial travellers for our gas; and we have taken up this honourable calling with very gratifying results. Originally, however, we were not advertisement champions; but, as the author's late chief, Mr. Edward Drory, used to say, we were first and foremost gas cobblers, whose pride and pleasure were on our works. Many of you have been through the blessed age of direct-fired settings, and then have had to learn such a terrible lot when Bunte and Schilling came along and brought science into the industry. The Association's Instructional and Experimental Gas-Works is both the fulfilment and the emblem of this grand development. When the Association, at Bunte's instigation, started the works, it impressed the seal likewise on our own development as engineers; and on this account the works is very dear to us. To-day, however, the author will touch only on a few points in connection with it.

The "loofah" is familiar to you in your bath-rooms; and when you experience daily the pleasant charm of this useful product of Nature, will you think of the cleansing and invigorating effect of our "loofah" on the gas industry?* The "loofah" is first of all an instructional works, a grand teaching medium for our rising generation, and a guarantee that the scientific spirit of Bunte will be cultivated further. The author need not dilate on how much the industry and what individual gas-works have to thank Bunte's pupils for—for all know it. Secondly, the "loofah" is a scientific experimental works. One of its chief performances in this direction has been the numerous exemplary investigations of typical coals. Have you considered how many millions are spent annually on gas coals? If so, you can have no doubt that exact knowledge of the goods he is buying is imperatively necessary to the gas manager, just as it is a primary part of the training of the commercial apprentice to learn about the goods in his branch of trade. The work of Dr. Bunte and Dr. Geipert has shown how the results of analysis and gas-making tests can be converted into £ *s. d.* The cheapest coals have been shown to be, in many instances, the dearest. Yet the author can well imagine many a town council impressing on its gas committee that the cheapest coals must always be bought. The solid work of the "loofah," however, has put the gas manager in a position to prove by figures to the authorities that his proposal to buy in future a good class of coal is economically most advantageous. Herr Ohlz also is to be congratulated on having shown that the quality of the gas coke produced must be always the best if it is to fetch a proper price. The coal factors must also be told that they must either make improvements in the sorting of coal or must bring their prices into closer agreement with its actual value. The time is now favourable for such representations, because the demand for gas coal will not increase in the immediate future as it has been increasing in the last two decades.

Of equal practical value to the industry with the coal researches has been the travelling work undertaken by the "loofah." It is at all times ready to make an exhaustive scientific test of the working results of any gas-works plant, either in reference to local conditions or generally. The tests made by it command our confidence—a most important factor in these days of strenuous industrial competition. How is the gas man to form an opinion, in the face of advertisements, on (say) different systems of settings, if he has not the incontrovertible figures of the "loofah" provided as a basis for comparison? On this account it is an advantage to be established in Germany, because the numerous novelties in connection with gas manufacture are tested and classified by the "loofah." Wherever the staff of the latter carries out a test, the staff of the gas-works concerned has the advantage of being initiated in the scientific modes of working followed at the "loofah." Further, the "loofah" is a useful handmaiden to the gas man in connection with the outdoor departments. It will test the efficiency of lamps, the trustworthiness of distant lighting devices; it is studying surface combustion and gas-heated irons, and is concerning itself with all technical developments in the use of gas. At the present time, it is erecting a special experimental house in order to investigate the highly important subject of heating by gas from every standpoint. The "loofah" deserves grateful recognition. In order, however, to grapple with the problems put before it, it requires funds; and these will readily be provided if each one of you will contribute his mite. Hitherto it has had very little—viz., an income of £950—whereas the Kaiser Wilhelm Institute for Coal Research at Mülheim has an income of £7500 per annum.

The author would, therefore, ask his hearers to impress on their municipal authorities that greater liberality on their part is essential for the "loofah," as well as for the Central Gas Publicity Bureau and the Commercial Association of German Gas-Works. Unanimity of purpose prevails in the gas industry. All belong to the parent Association, and to such of the other organizations as are suitable to the particular sphere of our work. There is no jealously between these bodies or their controllers. We may all congratulate ourselves on this harmony, and hope that it will be perpetuated for the welfare of the gas industry. But caution should be exercised to see that other organizations outside our circle, which rest mainly on the private interests of individuals, are not supported.

* "Luva," the German for "loofah," represents the initials of the German title of the Instructional and Experimental Gas-Works."

Lead Pipe in a River Bed.—In a paper on "High-Pressure Gas Submarine Pipes," read by Mr. C. R. Phenecie before the Wisconsin Gas Association, he referred to one of the pioneer installations, made under the personal direction of Mr. H. L. Rice at Norfolk (Va.), to connect the gas plant there with the distribution system at Berkley. Mr. Rice briefly outlined the arrangement in the remarks he made in the discussion of Mr. Shelton's paper before the Western Gas Association in 1903, and noticed in the "JOURNAL" at the time. The Elizabeth River had to be crossed, the width at the crossing being about 800 feet and the water salt and affected by the tide. Mr. Rice realized that steel pipe would not conform to the uneven bed of the stream, and that, in order to be secure, it must be buried in the mud at much as possible. At first the owners of the property insisted upon steel pipe; but it was unsatisfactory, and Mr. Rice was allowed to use lead. Extra heavy pipe was employed in as long lengths as possible; and it was laid very quickly. As the cost was not great, a second pipe was put down for safety. The pipes are still in use and giving satisfactory service, so far as can be learnt; and they are the only high-pressure submarine pipes of lead. This metal does not corrode in salt water, which is a great advantage.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Miscellaneous Papers at the Annual Congress.

In the two preceding issues of the "JOURNAL," the principal papers submitted at the recent congress of the French Society have been dealt with. It now remains to notice briefly the rest of the contributions, some of which are dealt with below.

The "Integral" Radiator.

M. Lebel presented a short paper to introduce, under the above name, a rather ingenious radiator constructed by MM. Aubert Frères. In his introductory remarks, M. Lebel offered some few general considerations, which are open to discussion, tending to condemn, from a physiological standpoint, appliances working by direct radiation. The one to which he called attention is a radiator with vertical wings, heated by a number of jets burning blue gas placed horizontally at the upper part. The products of combustion circulate downwards through the apparatus, and are drawn off by means of a small electric fan. All the radiators in the same room are connected by a pipe, which may be of lead, collecting the exhaust gases. A safety-valve cuts off the gas from the burners when suction accidentally ceases. The upper part of the appliance is brought up to 200° C. (about 400° Fahr.), and heated by radiation; the rest being heated by convection. The consumption of gas per hour is about 14 cubic feet; that of electricity, in a particular case, was 32 watt-hours for nine radiators, and would suffice to ensure a fall of pressure of 20·10ths in the collecting-pipe. The author considers that, in good conditions, the consumption of current would not exceed 2 watts per radiator. Owing to the relatively very low temperature at which the products of combustion are removed, the total efficiency of the apparatus appears to be very satisfactory.

The "Lampyris" Automatic Lighter and Extinguisher.

The weak point in automatic gas lighters and extinguishers is the device transmitting movement of the clockwork to the gas-distributing mechanism. There should be a perfectly impermeable joint between these two parts, making transmission of movement difficult. In the "Lampyris" lighter and extinguisher, of which a description was given by M. Mangiapan, distribution of the gas is ensured by an auxiliary spring independent of the one which actuates the clockwork. The transmission device is a rod oscillating in a spherical joint, entirely metal and perfectly impermeable, formed by a ball held against its seat by a spring, which is not in contact with the gas. The receiving part of the apparatus is a double leather valve, applied with force, and ensuring complete obstruction of the burner and the pilot-light at the highest pressures. Thanks to its arrangement, and the careful study of the clockwork by the maker, M. Farge (who has patented his device), ignition and extinction are, it appears, produced surely and without any explosion. The apparatus must be wound up every twelve or fourteen days. The duration of the lighting may vary from five minutes to twenty-three hours.

High-Power Lighting by Gas and the Half-Watt Electric Lamp.

This was the subject of a paper by M. Bergner, who compared the cost of public and private lighting by means of high-power compressed gas and half-watt electric lamps; his calculations being based on the prices paid in Paris for gas, electric current, and maintenance. Taking public lighting first, he put the total number of hours at 3794, of which 1815 (before midnight) would be full, and 1979 (after midnight) reduced lighting. The cost for gas would be 15 c. per cubic metre (3s. 4½d. per 1000 cubic feet), and for electricity 32·5 c. per kilowatt-hour. The comparison was made between three high-pressure gas-lamps of 2000 candles, costing 251 frs. per annum, having three burners, consuming 400 litres (14 cubic feet), two of which are extinguished at midnight, and three half-watt electric lamps, of which two are extinguished at midnight. It may be pointed out that the extinction of one gas-burner out of three still leaves uniform lighting; whereas the entire suppression of one half-watt lamp out of three produces zones of shadow which have a very bad effect. The total cost of gas, including maintenance, sinking fund, and consumption, is put at 1890 frs. (£76). For electric lighting, taking 7424 hours with lamps of 2000-candle power, current would cost 2412 frs. 80 c.; the replacement of lamps worn out after 1000 hours' use would entail an outlay of 252 frs.; and maintenance would come to 75 frs. a year—a total of 2739 frs. (£109 10s.). The difference in favour of gas is consequently 849 frs. per annum; in other words, electric lighting is 45 per cent. dearer than the other illuminant.

Coming to private lighting, with gas at 20 c. per cubic metre (4s. 6d. per 1000 cubic feet) and electric current at 50 c. per kilowatt-hour. M. Bergner compared a Graetzin gas-lamp of 1000-candle power nominal, working at ordinary pressure and a half-watt electric lamp of similar power, both in use for 1000 hours. The total cost of gas was, in round figures, 195 frs. (£7 16s.), and of electricity 286 frs. (£11 8s. 9d.)—a difference of 91 frs. (£3 12s. 9d.), or 45 per cent., in favour of gas, with electricity employed under the most approved conditions.

The presentation of M. Bergner's figures called forth some observations by M. Payet. He remarked that the half-watt electric lamp, which constitutes real progress in lighting by electricity, proves that, having regard to the existing condition of things, there is room, on the side of gas, for an invention of the order of that of Dr. Auer, when it first made its appearance. Comparing the energy expended by an electric lamp of d watts per hour with that of a burner consuming n litres of gas in the same time, and supposing the gas to have a heating value of 5000 calories per cubic metre (550 B.Th.U. per cubic foot), there would exist between these two expenditures, for appliances of the same intensity, and supposed to have the same practical yield, the ratio $n = 0{\cdot}172\ d$. Consequently, other things being equal, if $d = \frac{1}{2}$ (in other words, if a half-watt electric lamp can be produced) $n = 0{\cdot}086$; that is to say, it would be possible to produce a burner consuming less than a litre (0·0353 cubic foot) of gas per carcel (9·6 candles). Will this progress ever be achieved, and by what method of utilizing energy? It will be for the future to tell us. At all events, the preceding consideration is reassuring.

Removal of Tar from Dip-Pipes.

At the request of the Committee on Manufacture, M. Becquart brought under the notice of the members a tool for the removal of tar from the dip-pipes of hydraulic mains. It will be seen from the accompanying illustrations that it consists of a kind of rake with two branches attached to the end of an iron rod 7 feet long. The

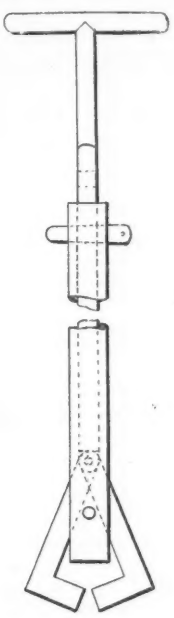


Fig. 1.

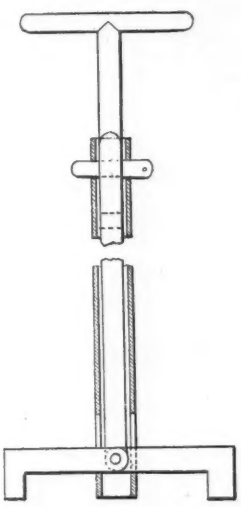


Fig. 2.

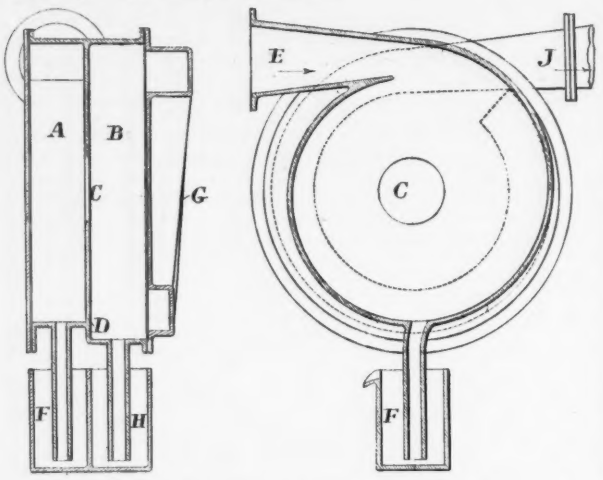
two branches pass into a case; and when the rod is moved forward they assume a horizontal position, as shown in fig. 2. The tool is introduced closed into the dip-pipes. On the rod being pushed the branches open, and allow of the easy removal of any hard tar which may be obstructing the dips.

A CENTRIFUGAL TAR-EXTRACTOR.

In order to facilitate the complete separation of tar from gas, the weight of the tarry particles may be artificially increased, or they may be subjected to the action of centrifugal force, either by the gas having imparted to it a rotary movement by means of a fan, or by being projected against the inner surface of a cylindrical vessel by a suitable fall of pressure—the principle of the "Cyclone" appliances. If, however, the gas and the tar fog are subjected to centrifugal force alone, separation is not complete, owing to the tenuity of the tarry particles, which militates against their sufficiently rapid displacement in the gas. This has led to a preliminary reduction of the size of the particles; and with the view of effecting it an appliance has been devised which was described and illustrated in a paper read at the last congress of the Société Technique by M. Mazeron. It is shown in the accompanying illustrations.

The apparatus (p. 32) consists of two chambers A B, side by side, and communicating by an opening C in the centre of the partition, D, which separates them. The gas reaches the inner surface of the chamber A, into which it is injected by a conical-shaped adjutage E (fig. 2) at a sufficiently high tangential speed, which gives to it a whirling movement, and all the gas converges towards the centre in order to pass by the opening C into the second chamber. The separated tar is collected in a receptacle F, forming a syphon, located at the bottom of the apparatus. In the second chamber the gas passes from the centre to the circumference, and the tangential speed is reduced and changed into pressure. The exit of the gas from the second chamber, which is circular, is effected by a volute G, of rather smaller radius than that of the chamber. In this way the separated tar is projected against the inner surface, and flows away by the draw-off syphon

H, while the tar freed gas escapes by the pipe J. The reduction in the size of the tarry particles is effected in the first chamber, and their separation in the second. The pressure absorbed by the apparatus is only 24-10ths for an average output, notwithstanding the high speed of nearly 500 feet per second attained by the gas towards the centre of the vessels. The appliance, which does not require supervision, may be placed upon the circuit of the exhauster; and, owing to the return regulator, the output of gas passing through it is constant.



In a few remarks upon the paper, M. Grebel expressed his astonishment at the small amount of pressure absorbed by the appliance, and praised M. Mazeron for having placed it upon the circuit of the exhauster, as this ensured a constant output. He said the cyclones did not work regularly on account of the difference of speed—a function of the output which was essentially variable in gas manufacture.

GAS-COOKING LESSONS IN PARIS SCHOOLS.

In a paper submitted at the last congress of the Société Technique du Gaz, M. René Masse, the Manager of the Gas Company supplying most of the suburbs of Paris, gave an account of the work done by them to impart to young girls, by means of lectures and cookery demonstrations in the communal schools, a knowledge of the value of gas in the household. The following gives an indication of the scope of the paper.

"In order to induce those who do not use gas to adopt it, and to encourage others to increase its domestic applications, it is first necessary to explain clearly all its advantages, and make them thoroughly understood, then to teach the existing or eventual gas consumers how to employ it in the most effective and economical manner. The true interests of the gas industry are, in fact, not to allow waste of gas, but, on the contrary, to educate the consumer, to make him a convinced adept, always more willing to extend the economic employment of gas." It is not easy to define more clearly than does M. Masse in these terms, with which he opened his paper, the object of real and useful gas propaganda —that which has to fight against prejudice and gross errors which still exist with the general public.

Among the numerous means for popularizing gas, M. Masse has applied in connection with his Company (the Société d'Eclairage, Chauffage, et Force Motrice) that of object-lessons in cooking for young girls of the higher classes in the communal schools of the Paris suburbs. The idea was a happy one of profiting by the development given everywhere to domestic teaching to disseminate among future housewives correct practical instruction as to the employment of gas. Those engaged in the propaganda work of the Company had first to dispel some hesitation on the part of the school authorities; but in explaining all the benefits the young pupils could derive from these lessons, the suitability of gas to conditions existing in working centres, and its capacity to decrease the quantity of smoke, which infects the atmosphere of towns, M. Masse easily won the day. Very soon even mayors and schoolmistresses, recognizing the interest taken in this initiative, expressed their thanks to the Company, and requested the lecturers to visit their communes.

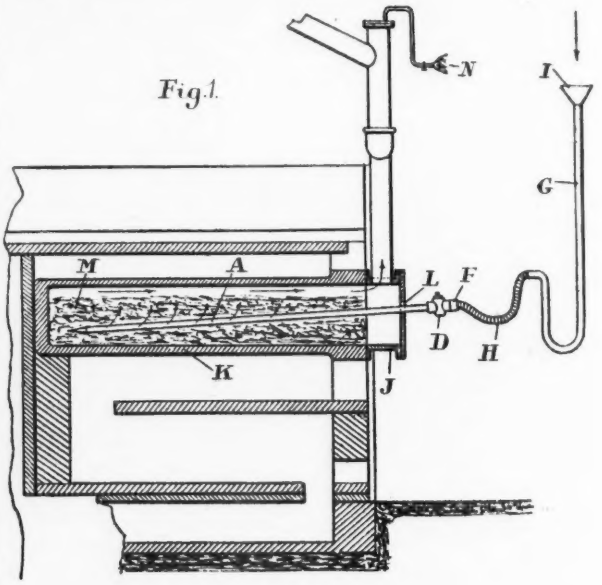
The programme of lessons consists of two parts: (1) A kind of theoretical course for children, in which practical instruction is given in the use of gas, and its advantages are pointed out, the cost of certain ordinary operations is stated, and the economy realized is brought into prominence. Accessorily the course deals with heating by gas. (2) An exclusively practical demonstration comprising the complete preparation of a simple bill of fare, during which the operator, working at a cooking-stove of the type let on hire, gives advice as to the best way to employ and utilize it economically—*i.e.*, as to ignition, regulation of burners, preliminary heating of the oven, and so forth. At the suggestion of the schoolmistress, the pupils have for a task to write an account of the lessons. One of these tasks, read, by way of example, by M. Masse, was very interesting.

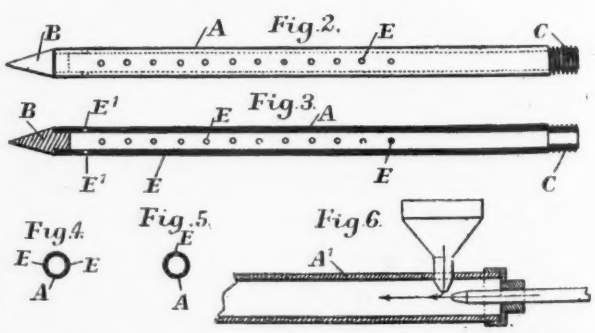
These lessons appear to have a double object. Probably the young girls, when grown to womanhood, and about to enter upon the duties of housekeeping, will recall them to mind. On the other hand, the disinterested advertising, by the pupils describing to their families what they have heard, seen, and tasted, is excellent. Great things, therefore, are to be expected from this system of propaganda, which is also a popularizing work of social interest which has not escaped the attention of the mayors and schoolmistresses, who are now most favourably disposed to these lessons. Already 82 schools have been visited, and applications are flowing in from communes to have lecturers sent to them.

PRODUCING WATER GAS OR OIL GAS.

A French patent has been taken out by M. André Le Morvan for a device by means of which either water gas or oil gas, or both together, can be manufactured in the plant at present employed for the carbonization of coal. The following is a translation of the principal portions of the specification, which is No. 466,309.

The object of the invention is a simple, practical, and convenient device by means of which horizontal gas-retorts can be utilized to manufacture water gas, oil gas, or both. It is claimed that the device ensures an excellent yield, whatever may be the carbonaceous material in the retort; and there is this peculiarity about it, that it will not be absolutely necessary for the retort to be completely filled. Various attempts have been made to manufacture water gas on a working scale in the horizontal retorts, 10 to 20 feet long, usually employed for the carbonization of coal; but it was essential for the retort to be always full. The least space existing between its upper side and the incandescent material allowed steam to pass. It was consequently not decomposed, and damaged the retort. This inconvenience led to the abandonment of the idea of utilizing ordinary coal-gas retorts for the production of water gas.





M. Le Morvan's arrangement is shown in the accompanying illustrations. Fig. 1 is a longitudinal section of the retort furnished with the device in question; figs. 2, 3, 4, and 5 are an elevation and sections of the pipe conveying the steam; and fig. 6 is a special branch for the conveyance of the carburetting agent by steam.

The device consists of a metal pipe A, rather longer than the retort. On to one end of this pipe a kind of pointed plug B is

screwed or soldered, while the other end C is wormed to receive a cock D. The pipe is perforated with a number of holes E along a portion of its length, corresponding to the length of the retort and the temperature, nature, and quantity of carbonaceous materials in it. The holes are arranged in zigzag order, usually in three rows; the diameters being in proportion to the spacing. The last holes E^1 near the plug are much larger than the others. The cock D has a wormed part to receive a three-piece branch F, enabling the latter to be connected with a syphon G (the branches of which are long enough to overcome the pressure existing in the retort) by a flexible pipe H. The syphon has a funnel I, into which water is conveyed. Thus arranged, the pipe A will be self-vaporizing. If necessary, it could be directly connected with a source of steam; and in this case the diameter of the holes would be less, in proportion to pressure of the steam.

The working of the arrangement is as follows: The lid J of the retort K being provided with a hole L of larger diameter than the pipe A, it is sufficient to uncover this hole when the fuel M is at a temperature of about 1000° C., and introduce the pipe so that it will slope slightly towards the bottom of the retort; care being taken that the lateral holes are in the horizontal planes, which can be easily ascertained by the position of the cock D. This cock is connected with the flexible pipe for the conveyance of the water or steam, and the space between it and the boring in the lid J is luted. By opening the cock, water or steam is let into the pipe A, and then working proceeds. During its course the pipe A can be pushed forward or drawn back so that the steam can work through the whole mass of material.

The pipe A can be introduced through the bottom of the retort, and the lid may have two holes, either for two pipes to work side by side or to have one pipe for water and another for oil or similar liquid capable of effecting self-carburetting of the water gas. In the latter case, it will be necessary to ascertain, according to the temperature of the retort, the nature of the combustible, and the carburetting agent, the right point at which to introduce the second pipe, so as to employ the best temperature for the decomposition of the carburetting liquid.

During the period of the production of water gas, it will be well to ignite a trial flame N at some point in the ascension-pipe of the retort in use. The colour of the flame will indicate whether water or steam is in sufficient buantity or in excess, and also the time when injection must be stopped. In working with steam, it will be possible to introduce some carburetting substance—coal tar, oil, &c.—into the current before its entrance into the retort. For this purpose, the pipe A will have a branch like A^1 (fig. 6) to facilitate the introduction of the carburetting liquid. A simple delivery-pipe produces the jet of steam which conveys the liquid contained in the reservoir; the quantity injected being regulated by a simple cock.

NOTES FROM ABROAD.

Cast Iron Mains Displace Steel Ones.

The Union Light, Heat, and Power Company, of Fargo (N.D.), have started the work of replacing all their present steel high-pressure gas-mains in Fargo and Moorhead with cast-iron mains, and changing the system of supply to low pressure only. Seventeen miles of pipe are affected—eight in Fargo and nine in Moorhead. The total cost of the change is estimated at $65,000.

A New Calorimeter.

In the "Physik-Zeit.," MM. E. Bompiani and G. Rumelin have described a calorimeter by means of which it is possible to investigate heats of reaction at temperatures that differ from those of a room. The calorimeter is enclosed in a large cylindrical Dewar flask, from which it is separated by pieces of cork. The apparatus is so constructed that heat is prevented from entering the space above the calorimeter. The temperature is measured by means of a resistance thermometer.

A Large Cookery Competition.

A cookery competition on a large scale was held recently in Denver, U.S.A., under the auspices of the Denver Gas and Electric Light Company, with the aid of the local Press and several merchants of the city. For the occasion, no fewer than fifty gas-ranges were fixed on the platform of the hall in which the competition was held, and large audiences watched the proceedings. Contests for all classes of the population were arranged, and the value of the scheme as an advertisement for the gas company must have been considerable, judging by the interest it aroused locally.

In the report presented at the annual meeting of the Royal Society of Arts last Wednesday week, reference was made to the course of Howard Lectures delivered by Dr. W. A. Bone, Professor of Chemical Technology at the Imperial College of Science and Technology, on "Surface Combustion." Professor Bone illustrated his lectures, which were noticed in the "JOURNAL" at the time of their delivery, by an interesting series of experiments, facilities for which were afforded by the courtesy of the Gas Light and Coke Company, who supplied various appliances, including a Keith and Blackman air-compressor, and of the Bonecourt Surface Combustion Company, who lent some of the necessary apparatus. The phenomena dealt with by the lecturer were consequently fully illustrated upon a practical scale.

DILUTION LIMITS OF INFLAMMABILITY OF GASEOUS MIXTURES.

Before the Chemical Society recently, a paper dealing with this subject was submitted by Messrs. H. F. COWARD and FRANK BRINSLEY. It consisted of two parts—the first being on the determination of dilution limits; and the second on the lower limits for hydrogen, methane, and carbon monoxide in air. For the following abstract of the paper (which was illustrated by photographs) and notes of the discussion we are indebted to the "Chemical News."

The smallest amount of hydrogen in an inflammable mixture of hydrogen and air has been variously stated as low as 4·5 and as high as 10 per cent. Similarly, the values given for the greatest amount of hydrogen in an inflammable mixture of hydrogen and air are as low as 55 and as high as 80 per cent. The hydrogen-oxygen mixtures show similar want of accord in the results of previous workers. A partial explanation exists in Dr. Clowes's observation that in certain weak mixtures a flame may be propagated upwards but not downwards.

A re-examination of the inflammability of weak gaseous mixtures has been started, based on the definition that a mixture at a defined temperature and pressure is inflammable *per se* if, and only if, it will propagate flame indefinitely; the temperature and pressure of the unburnt gases being constant. The flame observed in many weak mixtures travels more slowly than the convection current set up by the flame, so that the criterion of inflammability is the observed travel of a flame upwards through a vertical vessel of sufficiently great dimensions to avoid appreciable cooling influence by the walls, and to provide a sufficient length for observation of the flame to leave no doubt as to its capacity for indefinite self-propagation.

The experiments of previous observers do not satisfy this criterion, and the critical experiments of the authors have been carried out in vessels, one having a capacity of 170 litres (6 cubic feet), another a length of 4·5 metres (14 ft. 9 in.). With all three gases used, the flames in certain weak mixtures have been observed to start as vortex rings, which rose, expanded, and ultimately broke into a general self-propagating inflammation or were extinguished. The lower limits of the inflammability of mixtures of each of the three gases with air saturated with aqueous vapour at 17° to 18° C. were: Hydrogen, 4·1 per cent.; methane, 5·3 per cent.; carbon monoxide, 12·5 per cent.

In the discussion upon the paper,

Professor BONE drew attention to the great importance of accurate information concerning the behaviour of gaseous mixtures at or near the lower explosion limits, and congratulated the authors on both their experimental demonstration and the beautiful photographs which they had exhibited. He agreed in principle with the authors' definition of "inflammability," but pointed out the necessity of distinguishing between it and "ignitability." The phenomenon of ignition was very complicated, and was probably not a purely thermal one, as Professor W. M. Thornton had recently shown in an important communication to the Royal Society, on the electrical ignition of gaseous mixtures, from which it appeared probable that ionization was a factor precedent to the actual combustion.

Dr. SCOTT suggested that the mixtures of hydrogen with oxygen and with air might be made more luminous by using weighed quantities of sodium, which would give the required quantities of hydrogen in contact with the water. The brilliant yellow of the flame would probably enable much more detail to be visible to the eye and to be recorded on the photographic plate.

Dr. E. RIDEAL asked whether there was any indication of a dark wave preceding the luminous cap which travelled up the tube. The dark wave caused by local compression of the gas could be conveniently photographed by a method which he had used with great success in the case of rifle bullets travelling through different gases.

Dr. COWARD agreed with Professor Bone that it was desirable to distinguish between inflammability and ignitability. A large flame might be developed in a mixture when an electric spark was passed or a jet of flame introduced into it, though the inflammation would not be capable of indefinite self-propagation. This mixture would therefore not be inflammable *per se*, but a possibly dangerous flame might be formed in it. The initial impetus of the spark was not rapidly dissipated. The authors had seen such flames in mixtures just below the dilution limit which were nearly 30 cm. wide, and travelled 60, 90, or even 120 cm. from their source. Dr. Scott's suggestion for rendering the hydrogen flames more luminous would be useful for photographic purposes. Up to the present, the authors had desired to see and record the appearance of flame in pure mixtures, and for this reason to avoid the presence of spray or dust particles.

The 10,000 public gas-lamps in Boston (U.S.A.) are now being lighted under a new contract, for the unusually long period of one hundred years, with the Consolidated Gas Company. The price is $21 per lamp per annum—a reduction of $3. The contract dates from the 1st of April last; so that the city will have the advantage of the new price from that day.

WATER AS A MECHANICAL AGENT.

Extracts from the "Thomas Hawksley" Lecture.

It will probably be remembered that, through the liberality of Mr. Charles Hawksley, the Council of the Institution of Mechanical Engineers established a lecture in memory of Mr. Thomas Hawksley, one of the Past-Presidents of the Institution; and the delivery of the first lecture was entrusted to Mr. EDWARD B. ELLINGTON, M.Inst.C.E., also a Past-President. He took for his subject "Water as a Mechanical Agent;" and he has delivered his lecture in London and in some of the most important of the Provincial towns. It has been printed and a copy forwarded to us; and from it we make the following extracts.

THOMAS HAWKSLEY AND HIS WORK.

The lecturer opens with a brief survey of water engineering a hundred years ago, and then gives some particulars of the engineering education of Mr. Thomas Hawksley. Reference is made to his introduction of the constant supply of water at Nottingham, where he constructed the Trent works at the early age of twenty-three; and also to the great Liverpool scheme, in which he was associated with the late Mr. G. F. Deacon. Mr. Hawksley came to London in 1852, and had the satisfaction, during his career, of establishing at least 150 water-works at home and abroad. Mr. Ellington says the outstanding fact in connection with his work was its uniform success. Failure to him was an unknown quantity. This was due to the great care exercised by him in the preliminary stages of his work, to his high scientific attainments, to the uniform solidity of his designs, and to unswerving adhesion to his principle that cost was, after all, a secondary consideration in the construction of works which were to last for generations. Water-works, however, were not the sole outlet for his energies; and he became one of the leading gas engineers of the last century. This was brought home to his successors in this branch of engineering on the occasion of the jubilee last year of the British Association of Gas Managers, of which he was the first President. The lecturer concluded his remarks on Mr. Hawksley by saying that he possessed in a large measure the "essential characteristics of a great man."

GENERAL CONSIDERATIONS.

Proceeding to deal with the subject of his lecture, as indicated in the title, Mr. Ellington said it might seem at first sight that he was parting company with Mr. Hawksley's special work; but a little consideration would show that in fact the departure was more apparent than real. It was granted that his work was mainly in the direction of giving to towns a wholesome and efficient supply of water for the purpose of domestic consumption; but it was evident that, before a general supply of water could be made available for domestic use by a community, its mechanical aspect must be considered, and mechanism of some sort provided. The greater the area and the population to be served, the more efficient and complicated must be the mechanism employed, and the more thorough must be the co-ordination between such mechanism and the physical properties of the water itself. When used as a mechanical agent, water always involves either its flow from a higher to a lower level or a fall from a higher to a lower pressure. The former is characteristic of a gravitation supply, while the latter usually depends upon pumping. In some cases, part of the energy due to the fall is used for pumping, as in the case of the ordinary hydraulic ram; but, as a rule, some agent other than water—such as steam—is adopted. Water was probably the first mechanical agent used by man.

The ultimate source of all the natural water power in the world is the heat of the sun, which is continually and silently evaporating the water on the surface of the earth. The vapour rising in the atmosphere is condensed and descends again in the form of rain, both on the highlands and lowlands and in the oceans. There is therefore a perennial source of mechanical power in the fall of water from a higher to a lower level; and it is the power of falling water which is in evidence in every system of water supply and distribution, even though the primary object of such works has been usually that of domestic consumption rather than the use of water as a mechanical agent.

GRAVITATION AND PUMPING.

In what are known as gravitation supplies, it is obvious that the reservoirs from which they are given must be at such an elevation above the place of consumption as will afford sufficient pressure for the purposes of the consumer. The water-works engineer, in considering the requirements of the consumer, would take into account the desirability of supplying water to the tops of the highest buildings at the greatest elevation of the district supplied, the provision of sufficient pressure for the flushing of drains, for the extinction of fires, and the manufacturing and non-domestic uses for which a water supply might be needed. It will be generally found that, except in the neighbourhood of mountain ranges, there are insurmountable difficulties in the way of placing gravitation reservoirs at such an elevation as will provide the power required even to give such domestic supplies; the whole force available being insufficient to overcome even the losses in the conduits and pipes and to give the necessary pressure at the consumer's taps for his domestic use, apart from any use that might possibly be made of the water pressure for mechanical purposes. Further, the purity of water for domestic consumption being a paramount consideration, there is a tendency for the large cities, wherever practicable, to go far afield for their supplies into the nearest mountains. The farther they go, the higher must be the elevation of the reservoir; and, notwithstanding the greater height of the fall, the whole, or practically the whole, power of the water is absorbed in its distribution.

Where the conditions are favourable, it might be supposed that every engineer would adopt a gravitation supply. But the number of cases in which this is possible are limited; and in the great majority of water-works pumping machinery must be installed. The value of pumping water is not confined to the mere artificial production of the head required for an efficient water service, but it enables the valuable sources of underground water to be tapped. The water from springs and the deep underground natural reservoirs in the various water-bearing strata is not of the same class of purity as the mountain gathering-grounds, but, as is well known, is often highly charged with mineral matter. Such waters are probably quite as wholesome for general consumption as the softer upland waters, and are freer from organic impurities. When water is pumped, it is evident that the engineer is free to adopt any pressure he thinks suitable. He can supply at different pressures to serve different parts of the district or for different purposes; and in many ways he has a much freer hand than in the case of a gravitation supply.

WATER PRESSURE AS A MECHANICAL AGENT.

It was not until 1795 that the value of water pressure as a mechanical agent was at all adequately appreciated. In that year Bramah invented the hydraulic press, and it was this invention which led to the great advance in the utilization of water pressure during the last century. There have been two great lines of development in recent years. The one initiated by Bramah has been concerned directly with water pressure; the other has had to do with utilizing the kinetic energy of the flow of water. The principles of the hydraulic press are to be found embodied in every hydraulic pressure machine; and as the hydraulic press may be taken as the type of such machines, so the turbine may be taken as the type of a velocity machine.

Turbines were first introduced by Fourneyron about the year 1827. The original idea was to obtain a machine which would work with greater efficiency, and which could be more easily applied in circumstances under which the simple water-wheels had been used. They were accordingly usually driven by the natural streams of water at low heads. A great advance in the direction of utilizing very high falls was made by the invention of impulse turbines of the Girard type, in which the kinetic energy of the flow of water from a nozzle impinging on the wheel was absorbed and utilized. An immense development in the utilization of natural falls of water has been brought about recently by the great improvements effected in turbines, and the improved means of distribution of power through the harnessing of electricity to the service of mankind. The large reservoir works of the past were mainly executed for the purpose of distributing water for domestic use, and the pressures employed were only those which were suitable for home consumption. At the present day, the field available for the energy and skill of the water-works engineer is much wider; and all over the world great works for the storage of water for power purposes have been established or are in progress. So far as the reservoirs are concerned, there is no material difference in their construction whether the water stored is to be used for domestic purposes or for power; but for the former the pipe or conduit line is laid as nearly as possible to the hydraulic gradient between the impounding reservoir and the town or area to be served, whereas for the latter the object is to obtain the greatest possible fall in the shortest length of pipe-line.

PIPE-LINES.

As to water-pipes, it is difficult to realize that cast-iron mains were only introduced about the year 1800. In earlier times stone pipes—*i.e.*, quarried stones with holes made through them and jointed together with stone sleeves—were employed, and also wooden pipes or trees bored through and socketed together. I have frequently unearthed both kinds in the London streets. There has been a very interesting recent development in the Western States of America, where built-up wood-stave pipes are frequently used for large mains up to 52 inches diameter or more, and working under heads up to at least 200 feet.

In carrying out modern water-power works, many new problems have had to be solved. Carefully designed and constructed pipe-lines are essential to the success of such works. As an instance, those executed for the Aluminium Company at Loch Leven in Scotland may be mentioned. The reservoir has a storage capacity of 20,000 million gallons, and the power stored is 30,000 H.P. for 100 days. The pipe-lines consist of six steel pipes, 39 inches diameter, from 0·87 to 0·39 inch thick; and the anchorages, constructed of concrete, have to resist a pressure of 34 tons at the bends. The maximum head is 935 feet.

WATER POWER FOR DRIVING TURBINES.

A very interesting case of the utilization of water power is that at Schafthausen. The fall of the Rhine is employed to drive a number of turbines, which, coupled to dynamos, supply electricity to the neighbourhood. While the flow of water is constant, the demand for electricity is very irregular; and in order to utilize the principal turbine plant to the fullest extent, supplementary

plant has been put down, which can alternatively be used for pumping water up to a reservoir in the mountains at an elevation of about 500 feet, or for driving a turbine and dynamo by the water in the reservoir to help the peak load. The combined efficiency of the whole plant is 50 per cent.

As an example of the use of the flow of a tidal river near its mouth, there are the somewhat unique works lately completed at Chester. There is a very old weir there, close to the old bridge, which dams up the Dee to something below spring-tide level. This weir dates from about the time of William the Conqueror, and the fall has been continually used until recently for working water-wheels for driving a corn-mill. This has now been demolished, and a hydro-electric plant has been put down for helping the steam electricity supply of the Corporation. Three Francis turbines have been installed, aggregating 1100 H.P., though the maximum obtainable is not more than 800 H.P. It is expected that the estimated output of 1,250,000 units of electricity per annum will be obtained at a cost of 0·35d. per unit. The fall utilized is very similar to that at Old London Bridge—viz., 4 feet; and the power is really obtained through the tidal flow. The turbines run with from 15 inches to 8 feet head.

Energy Available in Water-Mains.

The water power in the mains of the large water-works with which Thomas Hawksley had so much to do was certainly from time to time considered, and many water-engines were designed, and some actually used. But the possibilities in this direction were not very large; for in the great majority of water-works there is little surplus power available. If one takes a standard of 200 feet head as the available pressure in ordinary water-mains, and an efficiency of 75 per cent. is assumed for the engine, the consumption of water would be 1300 gallons per effective horse-power-hour, which would be as much as the domestic use of water by about fifty persons daily. It is evident that only a limited use could be made of water power from such a source, and that it could only be effectively employed intermittently, such as for lifts and cranes, for organ blowing, or for presses of small power in operation a few times a day. It was for such purposes, in fact, that the water power in the mains was principally employed.

It is of interest to note that the great development of the last sixty years, due to the late Lord Armstrong, was started (after his preliminary experiments with a water-pressure engine) by the erection on the Quay at Newcastle of a hydraulic crane worked from the pressure of the water in the mains of the city. This was exactly the idea of Bramah, on which he had worked more than forty years before, though it is clear that Armstrong's invention was independent of Bramah's work. The experiment at Newcastle served to show the very serious limitations of the conditions of water supply then prevailing to further the objects in view. Armstrong was very soon convinced that, if water as a mechanical agent was to become a really important factor in industrial work, it was essential that there should be an entire severance from the already existing system of supply, and that everything should be started *de novo*, on the footing of a working pressure largely in excess of anything ever before attempted in the way of distribution. Ultimately he arrived at the conclusion that for the purpose of docks, railways, and contingent works, such as wharves and warehouses, a pressure of 700 lbs. per square inch was what was required. Tank towers had been built at Grimsby 200 feet high, according to the recognized standard of water-works practice. It seemed preposterous to contemplate the erection of towers 1500 feet or more high; and accordingly their equivalent was sought. The invention of the Armstrong accumulator resulted in 1851; and an entirely new system of water distribution then came into being. During the following half-century the Armstrong system had an uninterrupted career of prosperity, and was generally considered absolutely unrivalled for the service of railways and docks.

Development of Hydraulic Power Supply.

The lecturer's experience of Armstrong's work dates from the year 1870, at which period attempts were first made to establish high-pressure water-works exclusively for the general supply of hydraulic power in towns on the accumulator system. The pioneer undertaking was at Hull, followed some few years later by the great works of the kind in London, started in 1882, and afterwards in Liverpool, Manchester, Glasgow, Birmingham, and other places. These works have been particularly successful in both London and Manchester. In London, where more than 7000 machines are worked from 175 miles of mains, the pressure adopted was Armstrong's standard of 700 lbs. per square inch at the consumer's premises at the highest point in the system; and provision was made for a maximum pressure of 850 lbs. per square inch at the pumping-stations. In Manchester, the pressure adopted was 1120 lbs. per square inch, in order the better to supply the requirements of the great packing-houses. The question of pressure is one of great importance. In London it has already been found necessary to introduce feeder-mains working at 1000 lbs. per square inch. Owing to the improved methods of manufacturing steel pipes, there is now considerable economy in using the high velocity of flow of 10 feet per second in the feeder-mains, notwithstanding the greater distribution losses involved. There is a large use of hydraulic power for riveting and machine tools in boiler works, with the development of which the name of the late R. H. Tweddell will always be associated. He adopted for such work 1500 lbs. per square inch, and there was no difficulty in the distribution of this pressure. With the existing manufacturing facilities, there is no reason why a pressure of, at any rate, 1 ton per square inch should not be used for general distribution.

Relative Advantages of Water and Electricity.

It is almost impossible to deal with the subject of water as a mechanical agent without also having electricity in one's mind, because anyone who has had to do with power distribution in any form must necessarily nowadays consider the new factor of the dynamic application of electricity which has done so much for the world during the last quarter of a century. What water really is, and what electricity really is in its ultimate analysis, we do not know. They may be both vortices of force or even conceptions of mind. As engineers, we can only deal with them as manifestations of matter; and their respective merits should be considered without bias. It is quite impossible that we can be on the right track if we start with the assumption that there is necessarily a *primâ facie* case for cleaving to one and discarding the other.

So far as we know at present, there are no natural sources of electricity which can be directly tapped for use, as is the case with water power; and, from a mechanical point of view, the more direct the application of power the better. This is, however, often a "counsel of perfection." For instance, it has been found that, in order to use the natural falls of water to the best advantage, it is essential to convert this water power into electricity, because this can be used in such an infinite variety of ways, and because of the unrivalled facilities it possesses for distribution. But while there can be no question as to the great value of the hydro-electric works now being established all over the world, it is quite another thing to adopt electricity as the mechanical agent in circumstances where other sources of power are mechanically simpler and better.

While it may be taken as established that the turbine wheel and dynamo are the simplest and best means of utilizing natural falls of water, and thus obtaining electric current, so also it is impossible to imagine a simpler or more effective machine than a hydraulic press and its derivatives for certain purposes. In such cases it would seem to be desirable to convert electricity back again to water power, if direct hydraulic power is not available. Whether one power or the other should be used for any particular purpose should depend on the relative merits of the machines that have to be adopted. The practical monopoly which water-pressure machines maintained for so many years in the lifting and hauling appliances of docks and railways had an unfortunate effect in restricting improvement in detail, and the efficiency of such apparatus is, as a rule, far below that of which the system is capable. The system has also suffered from the defects of its qualities; for it is a fact that water-power machines will usually do their work somehow or other even when in a very defective condition of maintenance, whereas under similar conditions electrical machines will cease working altogether. Users of water power have often been content with plant which was unnecessarily costly to work because it has been found reliable and safe.

Power in Rainfall.

On a review of the whole subject, it appears that water power is likely to become increasingly important. It is perennial in its source; as a mechanical agent it has numerous ramifications, which are constantly extending; and its direct application to industry offers a large field for the exercise of the talents of the inventor and the engineer. The rainfall at 25 inches per annum is 1,600,000 tons of water per square mile in the year; and if it is assumed that the water actually falls a distance of 500 feet, the rainfall alone is sufficient to give over 100 H.P. per square mile continuing throughout the year. In the United Kingdom and Ireland there are 121,000 square miles and a population of 45 millions. At 25 gallons per head per day, one square mile will supply 40,000 persons; so that the total population requires for domestic use less than 1 per cent. of the total rainfall. Further, allowing one-third of the total yield for vegetation and evaporation, the net water power remaining for industrial use, if it could be stored, would give some 70,000 million horse-power-hours in the year. The average user would be for about 2000 hours in the year; and on this basis there would be available 35,000,000 H.P. These figures give some idea of the enormous energy of rain in the world at large, and the possibilities of the future.

Lymm Gas Undertaking.—In the "Warrington Guardian" of a recent issue "Worker" made the following remarks: "Has not the time now arrived for the ratepayers of Lymm to take rather more interest in their affairs than heretofore? Particularly, I refer to the acts of the Urban District Council as at present constituted. For instance, last week the Gas Manager received three months' notice to terminate his engagement, owing, I suppose, to his failure to make a success of the antiquated plant and wretched coal which is supplied to manufacture the gas from. It being impossible for any man to produce good results with inferior tools, they now propose to expend a large sum of money upon some new plant, and to obtain a younger man as manager. Do the ratepayers endorse the action of their supposed representatives (mostly self-elected) in this matter, or do they think an old and valued servant should receive fair play? I hold no brief for any man; but, in justice, I cannot pass a matter like this without a protest."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Calorific Values.

SIR,—It is regrettable that more time was not available for the discussion of this subject at the recent meeting of the Institution of Gas Engineers, as its importance at the present juncture can scarcely be exaggerated.

Legislative enactments are being laid down which may involve considerable trouble and expense to alter in the future, should such be found necessary in the interests of any special undertaking; and, could a concertive opinion of members of the Institution have been gleaned, it would have been of considerable value, whereas what appears to have occurred has merely been the expressed opinions of a very variable character, and not based on any particular grounds.

I have already shown in your columns the position in which London stands during the past five years, and have fairly clearly established:

Firstly, the relationship between calories and candles, with gas of the quality supplied; and,

Secondly, the influence of the chemical composition of the gas upon its calorific value.

In a letter by Mr. H. E. Jones, in the "JOURNAL" for the 23rd ult., he shows by deduction that the present London gas is represented by 37 B.Th.U. per candle of illumination. Whether or not this figure would be an elusive one to make use of, with any other candle power than that which it specifically represents, is a matter to take note of, as it must necessarily vary with every variation in the illuminating power. For instance, a 475 B.Th.U. gas may, under certain circumstances, be non-luminous in a flat-flame burner; so that the variations in the B.Th.U. per candle, below the 37 for the lesser candle value of gas, will move in a rapid ratio. Mr. Jones's suggestion, therefore, that companies working on a small scale should be specially favoured as regards the standard of quality to be supplied, may want looking into with considerable care.

The one point that the Parliamentary Committees of the present session have clearly established is that the gas is still to possess some degree of luminous value in a burner such as the public can reasonably use to-day. Fourteen-candle gas will approximately yield 7 to 8 candles in carefully selected and properly used flat-flame burners.

The question, therefore, appears to resolve itself into the degree of illumination which 5 cubic feet of gas will be required to give from a flat-flame burner such as the public may use.

Personally, I do not follow Mr. Jones's reason for suggesting that small companies should be differently treated from larger ones. If careful tests were made, it would in all probability be found that, on the average, the smaller companies are yielding a higher calorific value gas than some of the larger companies, who by over-exhaustion have increased the quantity of non-combustible gas in the volume sent out to figures that are little short of alarming; and, as already indicated, in my view, unless the calorific question is considered with the chemical composition of the gas, we may easily be led into a false position, and fix a standard that may give us as much trouble in the future as the candle standard has given us in the past.

Whatever the standard is to be, it must be such as can be produced with the type of plant at present commonly in use, and by the methods commonly employed, and with coal that it is found advantageous to buy in each locality. Where, however, the practice of over-exhaustion is followed, and a large additional volume of non-combustible gas is found on chemical analysis to be the result, then the question arises as to whether the practice of over-exhaustion, and the dilution of what is otherwise a comparatively high calorific gas by inert gases, is not false economy, and whether the practice should not be discontinued, and normal exhaustion of the charge substituted therefor and the addition of a gas—non-luminous, but having a calorific value of 300 B.Th.U., such as blue water gas will yield us. This in a large measure would solve the present difficulty of the "coke question," as it will be found that it is possible to mix as much as 20 per cent. of blue water gas (if admitted to the coal-gas retorts), and yield results far superior to over-haustion as practised to-day, which necessarily impoverishes the calorific value of the gas to a much greater extent than substituting for an inert gas of no calorific value a gas having a value of 300 B.Th.U.

W. R. HERRING.

Palace Chambers, Bridge Street, S.W., July 2, 1914.

[This letter is referred to in our editorial columns; but it reminds of the paper Mr. Herring read before the North British Association in 1906, in which he dealt more fully with the subject of the relation of candle power to calorific value, and gave a table (for gases ranging from 14 up to 26 candles) setting forth the B.Th.U. per candle per cubic foot. See "JOURNAL" for July 31, 1906, p. 318.—ED. J.G.L.]

Thermal Conductivity of Refractory Materials.

SIR,—In your issue of March 10 last is reported a lecture given by Dr. Mellor to the Manchester District Junior Gas Association, on "Refractory Materials in Gas-Works;" and the lecture is reprinted in a recently published book, entitled "Clay and Pottery Industries."

The author's deservedly high reputation gives weight to his opinions, and makes it desirable that any unsoundness, even in an inference from a speculation, should be indicated before it has time to do any harm. Dr. Mellor says:

> "It is usually considered that the amount of heat which traverses a slab of unit thickness in unit time is $K(T - T_0)$ calories per unit surface, when T represents the absolute temperature of the hot side, and T_0 that of the colder side. The amount of heat exchanged by radiation between a hot and cold surface in unit time is $K_1(T^4 - T_0^4)$ calories per unit surface. For fire-clay the value of K is nearly 0·0025 and K_1 nearly 8×10^{-11}. Consequently at a little below dull red heat the amount of heat radiated across an air space from unit surface in unit time will be equal to that which would traverse a fire-clay slab of unit thickness in the same time. The insulating properties of air thus break down in the vicinity of dull redness, and at higher temperatures the air-spaces behave as if air were a good conductor of heat. Unless something has been overlooked, *it is therefore inferred that a high porosity favours the passage of heat through the walls of a gas-retort at temperatures exceeding dull redness.*"

The words "unless something has been overlooked" suggest uncertainty existing in the mind of the writer, and may be regarded as inviting criticism. As is pointed out, the transmission of heat by radiation across a space increases much more rapidly with rise of temperature than transmission by conduction. There is a temperature at which the two become equal; *and if the space and solid are taken of unit dimensions* (1 *centimetre*), it can be shown by calculation that this temperature is at dull redness.

So far Dr. Mellor is right; but he assumes this temperature to be independent of the dimensions of the space and solid unit, and generalizes on that assumption. That this is not permissible can be seen at once by supposing the length of the space and solid to be halved, when the transmission by radiation is unaffected, but the transmission by conduction is doubled. Taking such small pores as mainly occur in refractory materials, if the space and solid be reduced to $\frac{1}{100}$ cms. in length, then the temperature at which equal amounts of heat would be transmitted by equal areas is some thousands of degrees Centigrade and outside the range of practice. The case can be restated thus (using Dr. Mellor's symbols):—

When the temperature of equivalence is reached

$K_1(T^4 - T_0^4) = K(T - T_0)$ if the solid conducting unit is of 1 cm. in length, but otherwise

$K_1(T^4 - T_0^4) = \frac{K(T - T_0)}{d}$, where d is the length of the solid conducting heat. Dr. Mellor overlooks the fact that d is not always equal to unity. The importance attaching to this consideration is obvious when we note that Dr. Mellor's conclusion as to the value of high porosity for increasing conductivity above dull redness is thereby invalidated. Legitimately deducible are the importance of the size of the pore, quite apart from the percentage volume occupied by the pores, and also the probable decrease of conductivity with increasing porosity at all the temperatures in ordinary use.

In conclusion, I may say that the substance of the criticism given above was put before me by one of my students, Mr. G. Dougell, in a thesis for the Honours B.Sc. degree entitled "Thermal Conductivity of Refractory Materials"—a subject on which we have been and are working.

JOHN W. COBB.

Leeds University, July 4, 1914.

Power Generation at Collieries.

SIR,—With reference to the "Communicated Article" on p. 706 of your issue of the 9th inst., dealing with the Yorkshire electric power plant at the Old Silkstone Collieries, I feel it incumbent on me to point out to you that your contributor is mistaken if he assumes that there must be a tremendous loss of power through the utilization of gas for boiler-firing purposes. This opinion, though very frequently expressed, is nevertheless erroneous.

People expressing it generally overlook the very high efficiency obtained from up-to-date combustion arrangements for gas, and the comparatively low load-factor of gas-engines.

The gas at the Yorkshire Waste-Heat Company's plant at the Old Silkstone Collieries is burnt by means of Terbeck furnaces; and the efficiency, calculated on the net calorific value of the gas, is 88 per cent. The heat consumption per horse power as related to gas is 1490 B.Th.U., whereas a gas-engine on an average load of 60 per cent. would consume about 1515 B.Th.U. per horse power. So that the plant is really more economical than a gas-engine plant could be if one takes into consideration that power companies of necessity work with a very varying load.

I have to-day written a letter to the "Iron and Coal Trades Review," dealing with Mr. Davidson's article on "The Development of the Internal Combustion Engine for Power Generation at Collieries." It deals exhaustively with the comparative running cost of turbines and gas-engines, and it may perhaps be interesting to your readers.

K. HUESSENER.

Twickenham, June 29, 1914.

[ENCLOSURE.]

Mr. John Davidson gives in his paper a number of tables which are to show the indisputable fact that gas can be used in internal combustion engines far more efficiently than in any other way. This contention is not only far from indisputable, but is very vigorously disputed by a large number of expert engineers, who have made the question of the comparative merits of the various prime-movers the object of very careful study.

Mr. Davidson, when compiling his tables, has overlooked two facts. The first is the question of load. He has assumed that 1 H.P. will consume 10,500 B.Th.U. per hour, which corresponds to a load of 100 per cent. of the gas-engine. The very fact that it is impossible to overload a gas-engine renders it impossible to run it at a 100 per cent. load. If 2000 H.P. per hour should be required on an average over 7200 hours, a station for 2700 to 3000 H.P. must be laid down.

I have before me a table with particulars of 29 power stations on the Continent, all using gas-engines varying in output from 700 K.W. per hour to 33,000 K.W. per hour. Among all these stations, there is only one with an average load of 51·7 per cent. The lowest load recorded is 22 per cent.; the average load of all stations, 38 per cent.

Mr. H. Hoff, of Dudlelingen, has published in the German journal "Stahl und Eisen" a table showing the heat consumption of gas-engines at varying loads. Choosing the most favourable instance, we find that the gas-engine in question consumed, per horse power per hour, at a load of 100 per cent., 7800 B.Th.U.; at 80 per cent., 12,000 B.Th.U.; at 75 per cent., 12,800 B.Th.U.; at 65 per cent., 14,000 B.Th.U.; and at 50 per cent., 18,000 B.Th.U. From this

table it is quite evident that it is not admissible to assume the heat consumption of a gas-engine at 10,500 B.Th.U. per horse power per hour. On the other hand, steam-turbines may be over-loaded with perfect safety; and although in the case of the steam-turbine a safety margin is also desirable, it is doing the gas-engine perfect justice if we say that, in the case of the gas-engine, the ratio between the average load factor and the rated horse power is always 25 per cent. smaller than in the case of the steam-turbine. If we assume the load factor of a turbine at 100 per cent. we cannot possibly base the average load factor of the gas-engine on more than 75 per cent., which, compared with the actual results of the above mentioned 29 plants, is very much better than the results obtained there.

A second fact which has been overlooked by Mr. Davidson is the greatly increased efficiency from gas-firing obtainable at present. If a Moore producer is used, and if the boilers are fitted with Terbeck furnaces, the increase in coal consumption as compared with coal-fired boilers, after allowing for the steam used by the producers, is only 35 per cent., whereas Mr. Davidson allows for an increase of nearly 100 per cent.

With regard to the coke-oven gas-fired boilers, Mr. Davidson does not state on which efficiency he has based the gas consumption; but I assume that it must be somewhere near 65 per cent. At least, I arrived at this figure by applying the following calculation from actual tests recently run at a Midland power station of the most up-to-date design. During a recent trial run 33,320 lbs. of steam from and at 212° Fahr. were consumed per hour in order to generate 1730 K.W., which correspond, with 13,120 B.Th.U. per horse power per hour. The 2000 horse power per hour would, therefore, theoretically consume 58,500 cubic feet of coke-oven gas of 450 B.Th.U. The £5350 per year mentioned by Mr. Davidson in Table IV. corresponds with 89,000 cubic feet of gas per hour. Hence the efficiency of 65 to 66 per cent. An up-to-date boiler going on coke-oven gas and fitted with Terbeck furnaces easily gives an efficiency of 85 per cent.; so that the actual gas consumption will be very much smaller than is assumed by Mr. Davidson.

I have recalculated Mr. Davidson's table by assuming a load factor of 100 per cent. for steam-turbines, and 75 per cent. for gas-engines. I have also entered the correct figures for the Moore producer and the Terbeck furnaces. I have brought the cost of making sulphate up to £4 per ton, and have made the necessary allowance for the consumption of live steam of the recovery gas plant, which has evidently been overlooked by Mr. Davidson.

The tables for these read then as follows:—

TABLE I.

Steam-turbine plant with coal-fired boilers.
Capital costs (building not included.)

2000 brake-horse-power of steam-turbines	£8,000
2000 brake-horse-power of steam-boilers	3,500
Total capital cost	£11,500
Running costs (7200 hours per annum).	
10,700 tons of coal at 12s. per ton	£6,420
Oil and stores	700
Labour	1,040
Maintenance at 2 per cent.	230
Interest and depreciation at 10 per cent.	1,150
Total running cost per annum	£9,540

Cost per brake-horse-power hour = 0·159d.
Equivalent cost per unit generated = 0·238d.

TABLE II.

Steam generating plant with boilers fired by recovery-producer gas.
Capital costs (buildings not included).

Recovery gas plant and boilers	£15,500
2000 brake-horse-power of steam-turbines	8,000
Total capital cost	£23,500
Running costs (7200 hours per annum).	
14,400 tons of coal at 12s. per ton	£8,700
Cost of making 580 tons of sulphate, £4 per ton	2,320
Oil and Stores	612
Labour, 1s. per ton of coal	770
Other labour	480
Maintenance at 2 per cent.	470
Interest and depreciation at 10 per cent.	2,350
Total running cost per annum	£15,702
CREDIT.	
Sulphate £6,960	
Tar 432	
	7,392
Total	£8,310

Cost per brake-horse-power per hour = 0·1385d.
Equivalent cost per unit generated = 0·1940d.

TABLE III.

Plant driven by a gas-engine with recovery producer.
Gas-engine running at 75 per cent. load.
Capital costs (buildings not included).

Gas-engine generator complete	£14,500
Recovery gas plant	9,000
Total running cost per annum	£23,500
Running costs (7200 hours per annum).	
Coal is assumed at 12,000 B.Th.U. per lb. Producer efficiency at 75 per cent.	
11,000 tons of coal at 12s. per ton	£8,600
Cost of making 432 tons of sulphate at £4 per ton	1,728
Oil and stores	840
Labour, 1s. per ton of coal	535
Other labour	312
Maintenance at 2 per cent.	470
Interest and depreciation at 10 per cent.	2,350
Cost of live steam 0·6 ton per ton of coal (6600 tons at 1s. 6d. per ton)	496
	£13.331
CREDIT.	
Sulphate £5,310	
Tar 318	
	5,628
Total	£7,703

Cost per brake-horse-power per hour = 0·128d.
Equivalent cost per unit generated = 0·18d.

TABLE IV.

Coke-oven gas burnt under steam-boilers with a 2000 brake-horse-power turbine plant.
Capital costs (buildings not included).

2000 brake-horse-power of steam-turbines	£8,000
Gas-fired boiler	4,000
	£12,000
Running costs (7200 hours per annum).	
Gas value assumed at 2d. per 1000 cubic feet at 450 B.Th.U. per cubic unit	£4,160
Oil and stores	500
Labour	480
Repairs and maintenance at 2 per cent.	240
Interest and depreciation at 10 per cent.	1,200
Total running cost per annum	£6,580

Cost per brake-horse-power per hour = 0·11d.
Equivalent cost per unit generated = 0·154d.

TABLE V.

Coke-oven gas used in a gas-engine.
Capital costs (buildings not included).

2000 brake-horse-power gas-engine and generator complete	£14,500

(Gas-engine running at 75 per cent. load factor.)

Running costs.

Gas value assumed at 2d. per 1000 cubic feet at 450 B.Th.U. per cubic foot (12,800 B.Th.U. per horse power)	£3,420
Oil and stores	610
Labour	312
Repairs and maintenance at 2 per cent.	290
Interest and depreciation at 10 per cent.	1,450
Total running costs per annum	£6,082

Cost per brake-horse-power per hour = 0·101d.
Equivalent cost per unit generated = 0 142d.

It will be noted that, for the sake of comparative figures, I have assumed the efficiency of the generator, together with Mr. Davidson, at 100 per cent., though, of course, this is an impossible figure; and it would be very much better to base these calculations on a generator efficiency of 90 per cent.

It will also be noted that, wherever completely new installations have to be laid down, a gas-engine (when compared with the steam-turbine) will mean a saving of 8·5 per cent. of the running costs in the case of recovery producers, and 8·3 per cent. in the case of coke-oven gas.

I am of opinion that these small savings are fully counterbalanced by the very much greater safety of a turbine plant; more so as the savings will at once be turned into losses should the average load factor fall below 75 per cent., which in the majority of cases is more than likely.

In the case of the bye-product producer scheme, it should be borne in mind that an all-round saving of 7 per cent. can be effected if the exhaust steam of the turbine is let back to the producer, so that no live steam is required in the producer.

The Recent Tornado in Calcutta.

SIR,—With reference to the paragraph in the "JOURNAL" dated May 26, headed "Violent Tornado in Calcutta," the statements regarding the damage to the public street gas-lamps are not correct. As a matter of fact, although the storm on April 28 was unusually severe, the breakage to the Corporation street-lamps was by no means excessive, and very few lights were extinguished—these being in small lanes where the old type of tin lamps, with 15-oz. glass, are fixed. These lamps will shortly be replaced by new copper ones. In the main streets and important side streets, where up-to-date strong copper lamps, with 21-oz. glass, have already been installed by the Corporation, there was scarcely any breakage, and the lights were not affected. The total damage throughout the city, in the municipal area, amounted to a few hundred rupees only; and this was put right within three or four days.

I shall be glad if you will be good enough to publish this information in an early issue of the "JOURNAL."

H. V. EASTWELL, Lighting Superintendent.

Calcutta, June 15, 1914.

[The report referred to was copied from one appearing in a Calcutta newspaper, to which our attention was directed.—ED. J.G.L.]

Removing Deleterious Substances from Tar.

SIR,—I note in "Register of Patents" in the issue of the "JOURNAL" for June 23, a description of a patent for removing deleterious substances from tar, tar-oils, or pitch, by means of water.

I may say that thirty years ago I adopted the plan of washing crude tar as received into the works with weak ammoniacal liquor, for the purpose of removing ammonium chloride from it—having found that it was this substance which had been giving me great trouble in the distillation. It choked-up the coils; and on two occasions it quite blocked them and more serious trouble was narrowly averted. I had, however, no elaborate arrangement for getting an intimate mixture of

tar and liquor, as described in the particulars of the patent you gave. But my plan was quite efficacious. We had no further trouble; and our men at the time making anthracene were never troubled with warts or cancerous or other growths.

The time when this substance began to accumulate in the coils was in the heavy creosote or early anthracene oil stage.

Having been responsible for the distillation of as much as a thousand tons of tar per week, I know something of the subject.

Liverpool, June 29, 1914. TAR DISTILLER.

Reflections from Field's Analysis.

SIR,—I regret that an error (of my own) crept into the above article in the "JOURNAL" for June 30.

On p. 1039, under the heading "Carbonizing Results and Influence of Water Gas," second paragraph, line 2, should read making *none* or less than 5 per cent., instead of "more or less than 5 per cent.

I would not have troubled you with this, but it rather alters the sense of the paragraph.

July 2, 1914. ENGINEER.

REGISTER OF PATENTS.

Distillation of Carbonaceous Substances.

CLARKE, HERMAN, of Austin Friars, E.C., and CARMICHAEL, J. T., of Barking, Essex.

No. 29,714 of 1912; July 24, 1913.

This invention relates to the distillation of carbonaceous substances such as low-grade coals, which, owing to their containing a high percentage of ash, or for other reasons, are of relatively low commercial value for ordinary fuel purposes, or for manufacture into coke; the object of the invention being to effect their distillation in such a way as to yield a maximum of condensible oils and spirit from the volatile matter in the materials, and to utilize the residue remaining after the distillation in the most advantageous manner. As one of the patentees was formerly connected with the "Coalite" schemes, it may be of interest to quote the specification of the present invention practically *in extenso*.

According to the invention, we so determine the conditions of distillation as to produce an oily distillate having a specific gravity approximately equivalent to that of water, which distillate on rectification yields a high percentage of light spirit of a specific gravity intermediate between that of petrol and benzol, and a larger amount of oil of higher specific gravity suitable for internal combustion engines of the Diesel type; a large amount of tar acids; and, in addition, pitch containing only very small amounts of free carbon, as well as other useful and saleable products. This is accomplished by effecting the distillation in vertical retorts partly by the external application of heat and partly by the introduction at the bottom of the retorts of a current of superheated steam or gas containing hydrogen, which passes freely upward through the charge in the retorts; infusible material, non-caking coals, or the residue from the distillation being mixed with the carbonaceous substances to be distilled for the purpose of securing free passage through the charge in the retort for the superheated steam or gas, and the distillation being carried out at a low temperature and continued until all the volatile oil contained in the charge has been vaporized. [The invention comprises the process hereafter disclosed. No claim, however, is made to the several details of the process individually, as these are generally known.]

In carrying the invention into effect, the low-grade coals or other suitable carbonaceous material are charged into vertical retorts which may be worked either intermittently or continuously, according as is most suitable for the particular class of material being dealt with—the intermittent method being preferable for some kinds and the continuous for others. The retorts are heated partly by external heating in the usual manner by means of producer gas, or the gas produced in the process after removal of its valuable constituents such as spirit vapours, and partly by the introduction at the bottom of the retort of a current of superheated steam or gas containing hydrogen, such as water gas, producer gas, or the gas produced in the process, or mixtures of such gases and steam. The sensible heat of the heated gases thus introduced assists in raising the carbonaceous matter to the required temperature for its decomposition; and the presence of hydrogen in the gases reduces the extent of the formation of unsaturated substances in the resulting condensible oils. The gases returned to the retort also assist in sweeping-out from the latter the oil vapours formed from the coal—thus preventing their further decomposition by lessening the time during which they are exposed to heat; and at the same time, by diluting these vapours, this returned gas also minimizes the amount of decomposition they undergo.

In charging the retort matters must be so arranged as to allow the introduced superheated gases to penetrate through the mass of coal, and thus effect the rapid raising of its temperature to the required degree—especially in the inner portion of the mass. The carbonaceous material—especially in the case of finely-divided material, or of material which becomes pasty on heating before undergoing decomposition, as in the case of caking coal—is mixed before charging with a suitable proportion of infusible material, in lumps of not less than nut size; the charging being carried out in any suitable manner to ensure that the added non-caking material is distributed uniformly throughout the retort to form channels for the superheated gas. Non-caking coals, or the residue produced from the coal itself, may be used for this purpose.

The most suitable temperature for the carrying out of the process with a maximum production of oils varies considerably with the different materials treated, but in most cases lies between 300° and 600° C.; and by heating the retort to such temperature a tar or oil is produced having a specific gravity approximately equal to that of water. The distillation is continued until all the volatile oil contained in the charge is vaporized.

In carrying out the process the pressure at the top of the retorts may be maintained below that of the atmosphere to assist in drawing off the gases and vapours rapidly.

The oil vapours in the gases drawn off from the retort are condensed by cooling in the usual manner, and separate together with ammoniacal liquor, from which they are separated by known means. The tar or oil is then rectified in the usual manner and worked up into valuable commercial products—such as spirits suitable for motor engines (these having a specific gravity intermediate between that of petrol and benzol), oil suitable for Diesel oil-engines, tar-acids, and pitch. The distillates are not suitable for rubber solvents; but a turpentine substitute, cleaning spirit, and burning oil can be obtained. The whole of the tar remaining after distilling off the water and motor spirit is of such a nature that it can be directly employed in Diesel oil-engines without further treatment if desired.

The gas produced, after the removal of products condensible by cooling, contains ammonia and a high proportion of vapours of low-boiling spirits. The former may be recovered by washing with water or sulphuric acid in the known manner, and the latter by washing with suitable oils. The gas, after such treatment, contains sulphuretted hydrogen, which may be removed by oxide of iron if desired. This gas may then be employed for the purpose of heating the retorts or of superheating the gases returned to the retorts, or in gas-engines for power production, or for lighting or heating.

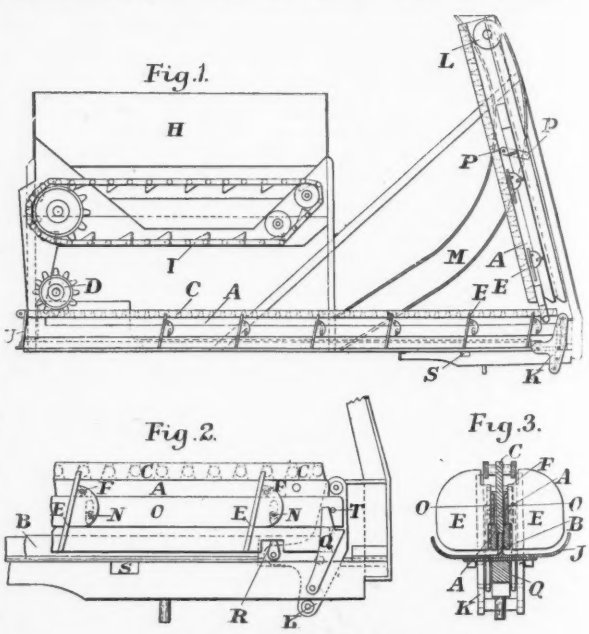
The residues from the low-grade carbonaceous material left in the retorts is a friable mass, which is discharged in any suitable manner, and "is in general unsuitable for sale for fuel purposes owing to its high percentage ash and friability." It may, however, be employed for the purpose of firing steam-boilers in the neighbourdood of the carbonizing plant, but is preferably treated in ammonia-recovery gas-producers, whereby it gives a large yield of sulphate of ammonia, and a large volume of producer gas, which may be used either alone or mixed with the gas from the carbonizing plant for the heating of the latter—the surplus being employed in gas-engines "for the production of electric power, where the latter is required, or for other power purposes."

Charging and Discharging Gas-Retorts.

KEW, H. E., of Manor Park, E.

No. 4629; Feb. 24 (redated Aug. 25), 1913.

This invention relates to apparatus for charging and discharging gas-retorts simultaneously, and capable of use in modified forms for charging only. The appliance comprises a jointed girder made up of suitable lengths hinged together in a manner to allow it to travel along a track provided for it in the machine. The girder is fitted with a rack to engage with a driving pinion, and is fitted with heads which push the coal into the retort and are automatically raised at the commencement of the return stroke and held in the raised position until the return stroke is completed, when they are automatically lowered. A shoot is moved to and from the retort with the girder a sufficient distance to enter the mouth of the retort; "the correct amount and time of such movement being secured by an anchorage engaging with the girder or the machine as necessary." To adapt the machine for use as a charger only, the leading push-head, which is made in one piece, is omitted.



Kew's Retort Charger-Discharger.

Fig. 1 is an elevation of the apparatus. Fig. 2 is a view (enlarged) of the end of the girder, showing the anchorage device. Fig. 3 is a cross-section of fig. 2.

The girder A comprises two lengths hinged together and provided at the base with flanges to guide it along the track B—a rail running along the coal-shoot J. The girder is fitted with a lantern rack C engaging with the driving pinion D. Push-heads E, made in two parts (right

and left hand), with flanges connected by cross-bars F N, are placed on the girder—the cross-bars F passing through holes in the girder to form hinges, and the cross-bars N passing through slots in the girder and in a long connecting bar O. The coal is fed from the hopper H by a push-plate conveyor I or a rotary drum into the shoot J; any loose coal which may fall on to the lantern rack C falling through into the shoot J. This shoot is fitted with an anchorage K engaging with a slot R in the girder, so that the shoot moves forward with the girder into the retort until the bottom end of K meets a stop, which turns the anchorage about its pivot on the shoot J (shown in fig. 3) into the slot S. The shoot J is thus arrested and held in the retort mouth until, on the return stroke, the end of the girder engages the anchorage K, raising it out of the slot S into the slot R, so releasing the shoot J and carrying it back.

The back length of the girder is fitted with two side runner wheels L to run along the track M, which is formed with two channels running from a vertical to a horizontal position. The girder is driven into the retort by the pinion D, and pushes the coke in front of it; the coal being dropped at the same time into the shoot J—the push-heads E pushing it along the retort. When the required charge is dropped, the conveyor I is stopped as by a tappet pin on the girder coming into contact with a clutch lever. The girder then continues its forward movement until it reaches its destination. At this point the trip lever P is just clear of the track B; but as the girder A is drawn back the trip lever engages with the end of the track B, is turned about its pivot in the girder, and, by engagement between a pin on P and a slot in the bar O, the bar is moved to the left in the figure, raising all the push-heads E and U. As the leading length of girder returns from the retort, its end engages the trip lever Q and rotates it about its pivot until it engages the pin T on the connecting bar O, and moves the connecting bar to the right in the figure to lower the push-heads E on the leading length of the girder. The push-heads on the back length of the girder are lowered as the ends of the two lengths come into contact on the forward stroke, which engagement moves the connecting bar on this length to the right, and lowers the push-heads.

The machine is put on a suitable carrying frame to be travelled along in front of the retorts and placed in front of the retort to be charged.

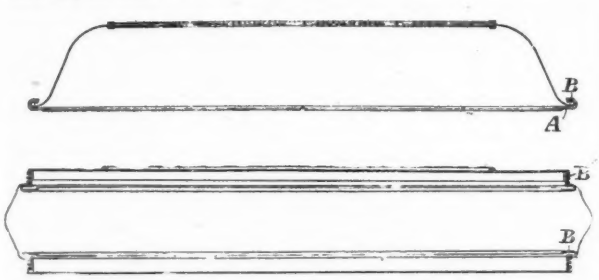
The patentee concludes his specification with these words: "I am aware that charging and discharging devices have been made in two lengths hinged together, one of which has been adapted to ride-up into a vertical position on withdrawal from the retort. I am also aware that discharging-chargers have been provided with coal-shoots moved to and from the retort with the girder, and adapted to be disconnected from the girder when the latter reaches the mouth of the retort on the charging journey, and to be engaged by the girder during the latter part of its return journey and so retracted. But my invention provides very simple means for performing this operation, comprising only a single pivoted anchorage for effecting both disconnection of the coal-shoot from the girder and connection thereto. I am further aware that a series of push-plates have been slotted and strung on a central pull-and-push bar comprising a series of pivotally connected links, by the reciprocation of which they may be raised and lowered. My invention, however, provides simple automatic means for effecting the reciprocation of two or more rigid bars hinged together."

Gas-Meters.

BERRY, J., and FOWLER, R., of Oldham, and METERS LIMITED, of Manchester.

No. 25,003; Nov. 3, 1913.

This invention, relating to dry gas-meters, has for its object to "provide a form of diaphragm carrier which shall allow of a maximum efficiency in the movement of the diaphragm and shall permit of ready access being obtained to the gas inlets to the chambers in which the diaphragms work."



Berry and Fowler's (Meters Limited) Dry Meter Diaphragms.

Two forms are shown of a diaphragm carrier constructed in accordance with the invention.

In the first one the metal diaphragm carrier A is of ⊐-shape with rounded corners; the flat side of the ⊐ being preferably at the lower side of the diaphragm and meter. The carrier is secured on the diaphragm edge (say) by being clamped over the edge after the insertion of a metal ring B therein. Or the carrier may be attached to the diaphragm in the manner set forth in patent No. 22,620 of 1912. The ⊐-shape of carrier with rounded corners is said to ensure "ready movement of the diaphragm under the influence of the gas pressure without undue puckering of the leather of the diaphragm, and also allows of ready access being obtained to the gas-ways or passages leading to the gas-chambers in which the diaphragms work."

The second shape of carrier can be employed with diaphragms of the peripheral type, which are secured to two carriers B and B^1 by tying.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Private Bills:—

The Gas and Water Provisional Orders (No. 2) Bill and the Ossett Corporation Bill were committed.

The Bedwas and Machen Urban District Council Bill, Deal and Walmer Gas and Electricity Bill, Market Rasen Water Bill, Middlesbrough Corporation Bill, and the Weston-super-Mare Urban District Council Bill were reported.

The Dundee Boundaries Extension and Gas Order Confirmation Bill, the Edenbridge Gas Bill, the Porthcawl Urban District Council Bill, and the Preston Corporation Bill were read the third time and passed.

HOUSE OF COMMONS.

The following further progress has been made with Private Bills:—

The Edenbridge Gas Bill and the Porthcawl Urban District Council Bill were read the first time and referred to the Examiners.

The Belfast Corporation Bill, Birkenhead Corporation Bill, Ellesmere Port and Whitby Urban District Council Bill, the Hayward's Heath Gas Bill, the Hightown Gas and Electricity Bill, the Longwood and Slaithwaite Gas Bill, the Motherwell Burgh Extension and Sewage Purification Bill, the Reading Corporation Bill, and the Skegness Urban District Council Bill were reported.

The Gas Provisional Orders Bills (Nos. 2 and 3), the Llanfaelog Water Bill, the Mexborough Urban District Council Bill, and the Rhymney and Aber Valleys Gas and Water Bill were read the third time and passed.

The Gas Light and Coke Company and others have withdrawn their petition against the London County Council (General Powers) Bill.

The Order of the 11th of May, that the Lurgan Gas and Electricity Bill be committed, was read last Tuesday, and discharged, and the Bill withdrawn.

Electricity Companies and the Supply of Apparatus.

Mr. Fred Hall, the Unionist Member for Dulwich, has given notice of his intention to ask the President of the Board of Trade if, under the existing law, electricity undertakings are precluded from running show-rooms, hiring, or selling apparatus, or doing repair or maintenance work in consumers' premises; if gas companies are enabled to perform these services; and if it is intended to take steps with a view to placing electricity undertakings on a similar footing in these matters.

Wages Clauses in Local Authorities' Contracts.

On the motion of Mr. Goldstone, the Labour Member for Sunderland, a return has been ordered showing, in relation to the principal local authorities in England and Wales, and to the provisions included in any contracts for the execution of works or the supply of materials entered into by them: (1) The number of local authorities who have adopted in such contracts clauses containing conditions as to rates of wages and other matters affecting workpeople in employment, to the effect of those set out in the circular letter of the Local Government Board dated Sept. 2, 1911; (2) the names of any local authorities who have adopted in such contracts clauses containing conditions on the above-mentioned subjects, but differing substantially from the clauses set out in the circular letter referred to, and the text of any such different clauses so adopted; (3) the names of any local authorities who have not adopted any such clauses in such contracts entered into since Dec. 31, 1911; (4) in the case of local authorities coming within sub-divisions 1 and 2 of the return, (*a*) whether the clauses have been adopted in all such contracts, and, if not, why not; (*b*) whether the clauses have extended to workpeople not engaged upon work performed under such contracts, but employed by the contractor on other work; and (5) what complaints, if any, have been received by the local authorities since Jan. 1, 1912, as to the non-observance of any such clauses adopted by them; and what measures have been taken by them, either by means of inspection or otherwise, to secure the observance of such clauses.

TESTING HIGH-PRESSURE GAS-METERS.

Clauses in the City of London (Various Powers) and the London County Council (General Powers) Bills.

The Bill of the City of London Corporation dealing with high-pressure gas-meters was before a Committee of the House of Commons last week. It was, however, found unnecessary to put this part of the Bill before the Committee, as an agreement has been come to between the gas companies who were opposing the gas provisions of the Bill, as well as similar provisions contained in the London County Council Bill, and the promoters of the Bills in question. The result is that the amended clauses as given below, and which are taken from the City of London Bill, will appear identically in the London County Council Bill.

CITY OF LONDON (VARIOUS POWERS) BILL.

Part III.—High-Pressure Gas-Meters.

20.—(1) On and after the 1st day of April, 1915, no high-pressure meter shall be stamped by an inspector in the City except in accordance with the provisions of the Act of 1859, as amended by this part of this Act, and no high-pressure meter shall be used in the City for buying and selling high-pressure gas, or for the collecting of any rates or duties

or for making any charges on the passage, transmission, or conveyance of high-pressure gas, unless such meter is stamped by an inspector in accordance with the said provisions as amended by this part of this Act, provided that, as regards any high-pressure meter in use in the City at the date of the passing of this Act, the provisions of this part of this Act shall not come into operation until the 1st day of April, 1920, and that, notwithstanding anything contained in this part of this Act, any such meter may (subject to the provisions of the Act of 1859) continue to be used until the last-mentioned date as if this Act had not been passed.

(2) On and after the 1st day of April, 1915, the Act of 1859 as regards high-pressure meters to be stamped, or in use, or intended for use, in the City as aforesaid, shall be read and have effect as if the provisions of this part of this Act had been inserted in the Act of 1859 instead of sections 12, 13, and 19 thereof.

21.—Every high-pressure meter shall comply with the following rules:

(1) The meter shall have permanently marked upon it in some conspicuous place the words "high-pressure meter," together with particulars of the pressure, or (in the case of a compensating meter) the minimum and maximum pressures at which it is constructed to be used, such particulars to be in terms either of the height in inches of a column of water, or mercury, or of pounds to the square inch.

(2) The meter shall be so designed and constructed as to ensure that when the supply of gas to such meter is turned on or off, there shall be no undue strain upon the mechanism of the meter.

(3) In the case of any meter which is so constructed as to allow gas supplied through such meter to exert pressure on any glass used in connection with such meter, plate glass only shall be so used, and such glass shall be adequately protected by metal bars.

(4) The measuring capacity at one revolution or complete action of the meter, and also the quantity of gas per hour at standard pressure and standard temperature, which it is intended to measure in cubic feet, or multiples or decimal parts of a cubic foot, shall be permanently dominated or marked on the index of the meter in legible letters or figures.

(5) The index of every meter shall be so fixed in the meter that such meter may be readily stamped by an inspector in such manner that the index cannot be interfered with or removed from the meter without defacing the stamp.

(6) That part of the meter containing the index and the gearing between the index and the measuring chambers shall be secured to the other parts of the meter, so that the meter may be readily stamped by an inspector in such manner that the meter cannot be opened without defacing the stamps.

22.—(1) No high-pressure meter shall be stamped by an inspector unless, after examining and testing the index thereof, he is satisfied as to the accuracy of such index.

(2) Every high-pressure meter, for the purpose of being tested, shall be fixed upon a horizontal base, and be tested by an inspector in accordance with the following rules:—

Test for Soundness or Leakage.

(*a*) Gas shall be passed into the meter under a pressure equivalent to double the pressure, or (in the case of a compensating meter) the maximum pressure, at which the meter is constructed to be used, and the outlet of the meter shall be closed; and if there is any leakage or defect in the meter whereby gas escapes, the meter shall be deemed to be unsound, and shall not be stamped. Provided that where the pressure, or (in the case of a compensating meter) the maximum pressure, at which a meter is constructed to be used exceeds 25 lbs. to the square inch, the pressure under which the gas shall be passed into the meter shall be equivalent to 1½ times the pressure or maximum pressure (as the case may be) at which the meter is constructed to be used.

(*b*) Gas shall be passed into the meter under a pressure equivalent to the pressure, or (in the case of a compensating meter) the maximum pressure, at which the meter is constructed to be used, and shall be allowed to pass out of the meter at the following respective rates, according to the quantity of gas per hour which the meter is intended to measure as marked thereon.

Quantity of Gas per Hour which Meter is Intended to Measure.	Rate per Hour at which Gas is to be Allowed to Pass Out.
Not exceeding 120 cubic feet . . .	Not exceeding 1-20th part of the quantity per hour marked on the meter or 3 cubic feet, whichever is the less.
Exceeding 120 cubic feet, but not exceeding 1000 cubic feet . .	Not exceeding 1-16th part of the quantity per hour marked on the meter, or 8 cubic feet, whichever is the less.
Exceeding 1000 cubic feet, but not exceeding 2000 cubic feet . .	Not exceeding 10 cubic feet.
Exceeding 2000 cubic feet . . .	Not exceeding 15 cubic feet.

Provided that in no case shall the rate at which gas is allowed to pass out of a meter as aforesaid be less than ½ cubic foot per hour. Any meter found not to work under such conditions shall not be stamped.

Test for Correct Measurement or Percentage of Error.

A sufficient quantity of gas or atmospheric air shall be passed through the meter at the pressure, or (in the case of a compensating meter) the varying pressures, at which the meter is constructed to be used, and in a quantity per hour equal to the quantity of gas per hour which the meter is intended to measure, as marked thereon. Any water used in such testing, and the air of the room in which such testing is made, shall be as nearly as practicable of the same temperature as the gas or atmospheric air passed through the meter. If the meter registers quantities varying from the true standard measure of gas more than 2 per cent. when corrected to standard pressure and standard temperature, it shall be deemed to be incorrect as to measurement, and shall not be stamped.

23.—No high-pressure meter shall be used unless it has affixed thereto, or immediately adjacent thereto, a gauge or gauges, or similar device or devices of such a character and so affixed that the pressure of the gas passing through the meter and (in the case of a compensating meter) the accuracy of the correcting mechanism may be readily determined by the consumer. Notice to the effect of the provisions of this section shall be permanently and legibly marked on every high-pressure meter before it is submitted for stamping by an inspector.

24.—Every high-pressure meter which shall be found by an inspector to comply with the rules contained in this part of this Act, and when tested in accordance with the provisions of this part of this Act, to be sound, and to work and to measure and register accurately within the limits set forth in the said provisions, shall be deemed to be correct, and shall be stamped by the inspector in such manner and on such part of the meter as shall be directed by the authority appointing him, or, in default of such direction, as shall in his opinion best prevent fraud.

25.—Fees for the examination, comparison, and testing with or without stamping of high-pressure meters pursuant to the Act of 1859, as amended by this part of this Act, shall be payable according to the volume of gas which such meters are respectively capable of delivering in one revolution or complete action of the meter, as follows:—

Volume of Gas which the Meter is Capable of Delivering as Aforesaid.	Fees.
Not exceeding 2 cubic feet . . .	3s.
Exceeding 2 cubic feet, but not exceeding 20 cubic feet . . .	3s., together with 1s. for each cubic foot or part thereof beyond 2 cubic feet.
Exceeding 20 cubic feet, but not exceeding 100 cubic feet . . .	£1 1s., together with 6d. for each cubic foot or part thereof beyond 20 cubic feet.
Exceeding 100 cubic feet . . .	£3 1s., together with 3d. for each cubic foot or part thereof beyond 100 cubic feet.

26.—(1) Notwithstanding anything contained in this part of this Act, any meter (not being a meter in use at the date of the passing of this Act, or a meter intended to be used for the purpose of registering at standard pressure the quantity of high-pressure gas bought or sold) may (subject to the provisions of the section of this Act of which the marginal note is "High-pressure meters not to be used without gauges"), by agreement between any gas company and a consumer of high-pressure gas supplied by such company, be used at any time before the 1st day of April, 1920, for selling gas to, and buying gas by, such consumer, and for the collecting of rates and duties, and for making charges on the passage, transmission, and conveyance of such gas, provided that there be permanently marked upon such meter in some conspicuous place particulars of the pressure at which it is constructed to be used, and that such meter

(*a*) Comply with the requirements of sub-sections (2), (3), (5), and (6) of the section of this Act of which the marginal note is "High-pressure meters to comply with certain rules."

(*b*) Satisfy the test prescribed by paragraph (*a*) of sub-section (2) of the section of this Act of which the marginal note is "Rules for testing high-pressure meters."

(*c*) Be a correct and sound meter within the meaning of the Act of 1859.

(2) Any meter which is intended to be so used under any such agreement as aforesaid, and which complies with the conditions specified in sub-section (1) of this section, shall, notwithstanding anything contained in this part of this Act, be stamped as complying with the requirements of the Act of 1859, as amended by this part of this Act, upon payment of the appropriate fee under the provisions of the section of this Act of which the marginal note is "Fees for testing and stamping high-pressure meters" for the examination, comparison, and testing of such meter. Provided that no such meter as aforesaid shall be stamped by an inspector unless he be satisfied that the meter is intended to be used under such an agreement as aforesaid.

(3) Nothing contained in, or done under, this section shall have any force or effect after the said 1st day of April, 1920.

27.—Nothing in this part of this Act shall confer any exemption from the provisions of any General Act relating to high-pressure gas-meters which may be passed in any future session of Parliament.

SWANSEA GAS COMPANY'S PROVISIONAL ORDER.

THE ONE-THIRD RESIDUALS PURCHASING POWER CLAUSE.

The exact wording of the clause to give effect to the decision of the Committee as to the use of the Company's gas lands for the purpose of dealing in residual products [see "JOURNAL," June 30, p. 1050] was the subject of a further application to the Committee on Tuesday, owing to a disagreement between the Parliamentary Agents representing the Swansea Gas Company and those representing the Alkali Manufacturers' Association, as to the precise interpretation of the Committee's decision.

Mr. E. C. COOPER (Messrs. R. W. Cooper and Sons, Parliamentary Agents), on behalf of the Gas Company, said that Mr. Kennedy, the Agent on the other side, desired to take the Gas Company still further

away from the decision of Sir Harry Samuel's Committee by inserting in the clause words to which he strongly objected.

Mr. JOHN KENNEDY said that under the South Suburban clause there was a full restriction upon the lands of the Company other than those dealt with in the Act this year; and unless a similar proviso was added to the clause dealing with the Swansea Gas Company, the latter would have the fullest possible powers as regards the lands dealt with in their Order of 1911. It was for this reason that he suggested the addition of the words "Notwithstanding anything contained in any Act or Order relating to the undertaking."

Mr. COOPER said the whole discussion took place upon the basis of whether the Company should have Sir Harry Samuel's clause with or without the proviso. The Committee had first decided that the proviso inserted by Sir Harry Samuel's Committee in the South Suburban clause should be imposed in the case of Swansea, and, further, that the restriction of one-third should apply to all the Swansea Company's lands.

The CHAIRMAN, after deliberation, said that it appeared to the Committee that the clause as submitted by the promoters really carried out their intention, and they would insert it in the Bill.

The full text of the clause is as follows:—

NEW CLAUSE 6.

(1) The undertakers may, upon the lands described in the schedule to this Order annexed, and upon any lands upon which they are by any Act or Order authorized to make and store gas and to convert and manufacture residual products resulting from the manufacture of gas, or any part thereof, erect, maintain, alter, enlarge, renew, improve, and use gas-works with all such erections and buildings as they may think fit, and may make and store gas, coke, tar, lime, ammoniacal liquor, and other residual products arising directly or indirectly from the manufacture of gas, and manufacture, convert, and otherwise deal in such products, and may do all such acts and things as they may consider necessary and proper for, or in connection with, the purposes aforesaid or any of them.

(2) The undertakers may at, or for use at, any works erected upon such lands—

(*a*) Work up and convert the residual products arising directly or indirectly from the manufacture of gas by them.

(*b*) Purchase, whether from other gas undertakers or elsewhere, and use, the materials required to work up and convert such residual products.

(*c*) Purchase the residual products arising from the manufacture of gas by other gas undertakers, and therewith manufacture other products of the same kind as the undertakers are manufacturing from their own residual products: Provided that the quantity of any residual product so purchased by the undertakers in any year shall not exceed one-third of the quantity of the like residual product which shall in that year arise directly or indirectly from the manufacture of gas by them.

(*d*) Purchase from other gas undertakers or elsewhere and use the materials required to work up and convert the residual products so purchased.

But the undertakers shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the undertakers or purchased from other gas undertakers is merely subsidiary.

BRENTFORD GAS BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, June 23.

(*Before Major* GUY BARING, *Chairman*, *Sir* STEPHEN COLLINS, *Mr.* TICKLER, *and Mr.* DUFFY.)

The object of this Bill is to consolidate and convert the capital of the Brentford Gas Company, to authorize the acquisition by the Company of the undertakings of the Staines and Egham District Gas and Coke Company and the Sunbury Gas Consumers' Company, and to confer further powers upon the Company. [The proceedings before the House of Lords Committee were reported in the "JOURNAL," Vol. CXXV., pp. 665, 747, 837.]

Mr. HONORATUS LLOYD, K.C., Mr. G. J. TALBOT, K.C., Mr. ARTHUR MOON and Mr. F. S. BAKER appeared for the Brentford Gas Company. Mr. W. J. JEEVES represented the Twickenham Urban District Council—the only opponent. A petition was also presented on behalf of the Corporation of Richmond, against alterations.

Mr. HONORATUS LLOYD, in opening, said the Bill originally had several main objects, one of which was the consolidation of the Company's existing capital. There were at present two classes of capital —10 per cent. and 7 per cent.; and it was desired to consolidate them into one class. To this, there was no opposition whatever. Another object of the Bill was to enable the promoters to acquire by agreement the gas undertakings in Staines and Sunbury, which immediately adjoined the present area of supply; and he was happy to say that this also provoked no opposition. There was also no objection to the addition of the Parish of Laleham. Therefore, owing to this large undertaking taking over these comparatively small ones, the price of gas would diminish year by year until it reached the figure charged in the existing area, which would be a very considerable reduction over the present prices. The next point was that it was proposed to adopt the calorific value test, instead of the old illuminating power test. This originally formed no part of the Bill; but in the other House a number of local authorities suggested that the calorific standard has now become much more important than the illuminating standard, and desired that it should be adopted, to which the promoters agreed. Then arose the question of how it was to be done; and he had informed the House of Lords Committee who considered the Bill that there was a Bill to be promoted by the Gas Light and Coke Company for the purpose of dealing with the calorific standard, and suggested that whatever was decided by Parliament to be the right and proper thing with regard to this matter in that case should apply in the present Bill, so far as the provisions were applicable to the district affected. Therefore, when the petitions of the opponents to the Bill in this House were presented, the latter had not seen the exact proposals. After discussing them with all the local authorities in the Company's area, however, they had been able to arrange the clauses which were now incorporated in the Bill, with the approval of everyone except the Twickenham Urban District Council. The population supplied by the Brentford Gas Company was 456,440, who had the goodwill and approval of the whole of the local authorities concerned except Twickenham, the population of which was 30,366. By clause 69 the Company sought to make an alteration in an existing Act with reference to the charge for public lighting. This clause provides that section 34 (charges for gas supplied to public lamps) of the Act of 1868 shall be read as if the words "for gas supplied for lighting purposes" were inserted after the words "charged by them." In 1868, when the clause which it was sought to amend was passed by Parliament, the gas industry was in a very different state to what it is now. By that section it was provided that for public lighting there should be no greater charge made than the lowest in the district, which at that time was quite fair, because gas was used for lighting only. At present, however, gas was very largely used for heating and cooking, &c.; and in order to compete with electricity, the price charged for gas used for heating and cooking was less than the charge for that used for lighting purposes. The Company could not put their price for cooking and heating as low as they would like to owing to this section, as they would be compelled also to supply gas for public lighting at the same very low price, which was never intended. He therefore asked that, in order to enable the Company to give a supply to those who desired gas for heating, cooking, and power purposes at the lowest possible price, for the future this section should state that the public authority shall be entitled to a supply for public lighting at the lowest price charged for lighting purposes only. With regard to the petition of the Twickenham Urban District Council, this drew attention to the means of testing the gas supplied by the Company, and stated that no new powers should be conferred upon the Company until the provisions were amended in accordance with modern requirements. Objection was also taken in respect to testing the gas. The Bill provided that the Company should maintain the existing testing-stations at the works of the Staines and Sunbury Companies, and also two testing-places and apparatus for the testing of gas manufactured at the Company's works, other than the works of the Company at Staines and Sunbury—*i.e.*, that manufactured at the Brentford and Southall works. These stations would be placed at points where all the gas coming from these works must pass, and everyone was satisfied with this, with the exception of the Twickenham Council, who, in addition, wished to have one in their own district. If a station was erected in the Twickenham district, why not in all the other districts supplied by the Company? There was at present a testing-station at Mortlake, which had only been used once in thirty years. Therefore the Company asked that such a provision should not be put in the Bill. With regard to the price for public lighting, Counsel pointed out that the local authorities usually asked for a price at which the public lighting would be undertaken for a given number of years. With some of the local authorities in the area of supply, the Company had contracts for five years. On this security, of course, the Company were able to quote a lower price than otherwise would be the case. Twickenham, however, provided for their public lighting year by year. Therefore the price charged was a little higher than in some cases; and they now sought to get the price lowered to that paid by some of the other local authorities by means of a flat-rate. These were really the only points raised in the petition. The only other petition was that of the Corporation of Richmond—against alterations in the Bill.

Mr. *A. A. Johnston*, the Engineer and Manager to the Brentford Gas Company, said that there were originally six petitions—namely, by the London County Council, Hammersmith Borough Council, Wandsworth Borough Council, Richmond Corporation, Twickenham Urban District Council, and the Metropolitan Electric Supply Company—this Company was refused *locus* by the Court of Referees [see "JOURNAL," June 16, p. 806]—but only that of the Twickenham Council remained. With regard to clause 61, dealing with the provision of the two testing-stations at Southall and Brentford, and the maintenance of those at the Staines and Sunbury works, the scheme of this clause was that at each place where gas was manufactured there should be means of testing it, as it was separately supplied from each works. He did not understand why the Twickenham Council wanted a testing-station in their district, as it would be the means of testing gas which had already been tested. He handed in plans to the Committee showing the general arrangement of the mains at the works and in the district. With regard to the objection raised in the petition dealing with the charge for public lighting, witness repeated the reasons for amending the previous Act of the Company.

Mr. JEEVES, cross-examining, said that the local authorities were the largest customers that the Company could have. But witness replied that this might be the case in Twickenham; it was not so in some of the other districts in his supply area. Counsel pointed out that some of the local authorities lighted the streets with electricity, whereas Twickenham had remained faithful to the Gas Company. But witness held that this was due to the fact that the price had been reduced very considerably in Twickenham during the past few years. In reply to further questions, witness claimed that the Company had power to differentiate between one district and another in regard to the price charged for public lighting. Counsel said that to-day the Company was supplying gas for public lighting at 1s. 9½d., and the price on which the dividend was based was 2s. 4d.—a difference of 6½d., or 23·2 per cent. Therefore it was reasonable that the percentage which the lowest charge bore to the dividend price should also be reserved to Twickenham. On the question of testing-places, clause 28 of the Gas-Works Clauses Act, 1871, stated that the undertakers should cause to be provided at the place prescribed, and within the prescribed time, a testing place and apparatus. Counsel asked whether there were any places prescribed for the two testing-places existing. Witness said that the clause read

"a point at which all the gas may be tested;" and therefore the places were prescribed. Counsel pointed out that if he wanted to know for himself whether he was getting his statutory gas he would have to make a test at both works—as part of the gas might come from one works and part from another—in order to find out. Witness agreed that this was so, although a fair test could be made at either of the works of the gas supplied to Twickenham. With regard to the testing-station at Mortlake, Counsel suggested that the reason this was not used was because the apparatus had become obsolete; but witness would not admit this.

Mr. TALBOT, in re-examination, pointed out that, in view of the fact that only one calorific test could be made in one day, all the local authorities in the Company's area could combine and appoint one gas examiner. On the question of the Southall and Brentford testing-stations not being at a point where all the gas had to pass, if this was not the case the Company could be proceeded against, on the ground that they were not carrying out the terms of the Bill.

Mr. JEEVES, at this point, pointed out that the Twickenham Council were prepared to erect and look after the testing-station, if the Company provided and maintained the apparatus.

Mr. *E. H. Stevenson* said that clause 61 gave the public every protection. He did not think that the Twickenham Council should be differentiated from the rest of the area. If one of the authorities in the area of supply sent their gas examiner to test the gas, this would be a test of the gas supplied to the whole of the area. There could not be any trickery in the supply to Twickenham. Therefore, no public advantage would be gained by having a testing-station there. There was no possibility nowadays of a drop in the quality of the gas from the time it left the works until it got to the place to be supplied, although this had happened in the old days, when the illuminating test was used. This was why testing-stations in the past were some distance from the works. With regard to the clause for public lighting charges, this was a very reasonable and fair provision.

In cross-examination by Mr. JEEVES, witness said that the limitation to one calorific test per day was quite right, because the local authorities could agree an examiner between them who would act for them all. If the other authorities would not agree to the man the Twickenham Council wished to engage, this showed very bad feeling between them; but there was more than one gas examiner to be had.

This closed the case for the promoters.

Mr. JEEVES then addressed the Committee on behalf of the Twickenham Urban District Council, but did not call any evidence. He was prepared to accept the conditions of the calorific test set out in the Gas Light and Coke Company's Bill, including the standard of 540 B.Th.U. Section 29 of the Gas-Works Clauses Act, 1875, provided that each local authority in the area of a gas company should be at liberty to appoint an examiner, who would have the right daily to make tests on behalf of the persons by whom he is appointed. This was the only provision for the appointment of gas examiners. Section 28 of the Act of 1871 provided that the place at which a testing-place was to be erected should be prescribed. Unless prescribed, it was not a testing-place within the meaning of the Act. In this case he submitted that the clause did not in any sense prescribe the place.

Mr. HONORATUS LLOYD said the Company would put in that the existing testing-places shall be deemed testing-stations within the meaning of the Act of 1871.

Mr. JEEVES said this would meet him on the point of having a "prescribed" testing-station, but not as regards the erection of one in Twickenham. With regard to the question of only one test being made in one day, he submitted that this limitation made testing perfectly impossible if the powers of section 29 were to be followed, and that the local authorities in London should have the right to test at any hour of the night or day. The provisions of section 29 of the Act of 1871 were made at a time when not so much gas was used in the day time as is the case at present, and it only applied to the illuminating test and not the calorific test. He maintained that it was a reasonable proposition for the Company to supply the necessary apparatus for a special testing-station in Twickenham if the Council provided the building and appointed the gas examiner. Finally, on the question of the price for public lighting, he reiterated the point made in his cross-examination that it would be unfair to relieve the Company of their present obligation to supply public lighting at the lowest charge made to any consumer, and maintained that the meaning of this obligation was a flat-rate to every local authority in the district.

After the room had been cleared,

The CHAIRMAN said: The Committee find the preamble proved.

LONGWOOD AND SLAITHWAITE GAS BILL.

This Bill, which has already passed the House of Lords [see "JOURNAL," May 5, p. 363], was last Wednesday sent forward for third reading by the Unopposed Bills Committee of the Commons.

Mr. WILLES JOHNSTON (Messrs. Torr, Durnford, and Co., Parliamentary Agents), speaking with regard to the capital, said that the Bill gave power to the Longwood Company to raise some capital authorized but not yet fully called-up by the Slaithwaite Company, amounting to £10,000. With the exception of this, they were not asking further capital powers. The position would be, when the amalgamation was effected, that there would be about £110,000, of which £14,500 or thereabouts would be required to meet the over expenditure on capital account of the Longwood Company and the costs of the Act; leaving about £95,000 available, which it was estimated would last for the next ten to fourteen years.

Mr. E. MOON, K.C. (Speaker's Counsel), said that this £10,000 was not treated as being additional capital within the meaning of the Standing Order, which required that it be put up to public auction.

Mr. JOHNSTON said they had given the Slaithwaite Company's shareholders the opportunity of taking it up, because it was authorized but unissued capital.

Mr. MOON said the Standing Order was held not to apply, because the capital was already authorized.

Mr. JOHNSTON said that was so.

NORWICH ELECTRIC TRAMWAYS BILL.

A Protective Clause for the British Gaslight Company.

HOUSE OF LORDS COMMITTEE.—Monday, June 29.

(*Before the Duke of* NORTHUMBERLAND, *the Marquis of* CAMDEN, *the Earl of* ONSLOW, *Lord* MANNERS, *and Lord* TWEEDDALE.)

The object of this Bill is to authorize the Norwich Electric Tramway Company to construct additional tramways and other works.

Mr. COURTHOPE MUNROE appeared for the promoters; and Mr. W. E. TYLDESLEY JONES represented the British Gaslight Company, Limited, the only opponents.

Mr. COURTHOPE MUNROE, on behalf of the promoters, said that the tramway company was formed by an Act of Parliament in 1897, and in 1898 obtained further powers. There was no preamble opposition to the Bill, clause 2 of which incorporated the provisions of the General Tramways Act, 1870. The British Gaslight Company were not opposing on preamble, but in order to obtain something more than was given to them by the latter Act. In their petition they stated that the powers sought by the Bill would prejudicially affect their business, in that they would enable the tramway company to alter the position of, and interfere with, the mains and pipes of the gas company; and they apprehended that the tramway works would seriously damage their pipes and mains and render them less secure, interfere with the efficient carrying out of their statutory obligations, and involve them in additional expense in repairing and maintaining the pipes, unless provisions were inserted for securing that the works should not interfere with, or injuriously affect, the gas company's property, and that the tramway company should make compensation for any damage in consequence. In many cases the Court of Referees had refused to allow *locus standi* to gas and water companies, on the ground that the Tramways Act of 1870 afforded sufficient protection; and in this connection the case of the Lea Bridge Tramways Bill, 1881, was mentioned. What was the use, asked Counsel, of elaborate provisions under the general law if companies were still to be allowed to fight the same battle over again upon each Tramway Bill? There were similar cases in which *locus* was not allowed in 1900, 1904, 1905, 1907, and 1913. Section 30 of the Tramways Act provided that before any tramway companies did any work they were to give seven days' notice to gas or water companies; and if a gas company thought their pipes would be interfered with, they had power to ask that a plan and section of the works should be at once provided. If the parties did not agree, however, they had power to call for an arbitration under clause 33—the arbitrator to be appointed by the Board of Trade. Section 30 also provided that no works of the gas company could be interfered with without their consent, that the tramway company were not to interfere with the powers of the gas company under their own Private Acts, and that they should make good all damage. Clause 32 preserved to the gas company the powers which they have under their own Private Acts, provided that they did as little damage as they could to the tramway. It also provided that the gas company should give the tramway company eighteen hours notice of any work they wished to do, that they were not to be liable to pay the tramway company any compensation for damage done to the tramway through this work, and that any additional expense imposed upon the gas company due to the existence of the tramways in any road where the existing mains or pipes should have been laid before the construction of the tramway should be borne by the tramway company. In addition to all this, clause 55 of the Tramways Act made the tramway company liable for everything they did, with the exception that if they carried out their parliamentary powers without negligence they were not liable. Therefore, he did not see why the General Act of 1870 should be altered, except, perhaps, with regard to the question of motor omnibuses. This was a matter entirely for the Corporation, who had power under the Bill to make bye-laws. The Bill was agreed with the Corporation; and Counsel asked that the *locus* of the Gas Company should be disallowed.

Mr. TYLDESLEY JONES said that the Bill proposed to do four different things to which the Gas Company objected. First of all, it proposed to authorize the construction of tramways in a city in which they had gas-pipes; and this would cause them injury, because under the Bill they had not sufficient protection. Mr. Munroe's arguments had gone entirely on this one question of the construction of new tramways, and had left out the other points. The second power objected to by the Gas Company was with regard to street works. Power was sought in the Bill to widen streets; and in this widening of streets power was taken to interfere with gas pipes and mains—none of the provisions of the Tramways Act applying to this at all. The precedents referred to by Mr. Munroe of the Court of Referees disallowing *locus* to gas and water companies did not apply to street works at all—in fact, in the case of street works *locus* had always been conceded. The next point was the power taken to run motor omnibuses. At the present moment anybody, on getting a proper licence, could run motor omnibuses in Norwich. But they were subject to the common law of England, which provided that if they put vehicles on the roads, whether omnibuses or vans, which were unreasonable with regard to weight or construction, and so caused damage to the gas-pipes in the street, the owners of the gas-pipes could get damages. This was when the owners of the motor omnibuses did not possess statutory authority. But if an Act of Parliament was passed authorizing them to run motor omnibuses or vans, the common law liability did not apply. It was because of this that the Gas Company asked the Committee to insert a clause that, notwithstanding the fact that the Tramway Company obtained statutory powers to run motor omnibuses or motor-vans, they should not be exempted from any possibility of damage which they might cause. The Gas Company also objected to the Tramway Company having power to stop-up streets temporarily, on the ground that no provision was made for them to have access to their pipes.

The CHAIRMAN asked whether this provision was to be found in the General Act.

Mr. TYLDESLEY JONES said there was nothing in the General Act

which enabled the Tramway Company to stop-up streets; but the power was given in clause 12 of the present Bill. Coming back to the whole question, Counsel remarked that it had been stated by Mr. Munroe that, under the Act of 1870, the Tramway Company could not interfere with gas-mains. The Act had been framed in 1870, when the old horse trams were used. A tram system to-day, however, was an entirely different matter, consisting of very heavy street cars running at high speeds; and added to this there were very heavy poles, which had all come into existence since 1870. The Court of Referees had conceded *locus* on this ground in the case of the Edinburgh Tramways Act, 1893. In conclusion, Counsel submitted that, with regard to street works, omnibuses, and the stopping-up of streets, he was clearly entitled to *locus*.

Mr. MUNROE, in answer to the CHAIRMAN, said that the Tramway Company had no absolute right to stop-up streets, because they had to obtain the consent of the road authority.

The CHAIRMAN said the Gas Company had no *locus* with regard to the construction of tramways; but the Committee would be pleased to hear them with regard to the widening of streets, the running of motor buses, and the stopping-up of streets.

Mr. *E. A. Hopkins*, a Director of the Norwich Electric Tramways Company, formally proved the preamble of the Bill.

Mr. TYLDESLEY JONES, in submitting a clause for the protection of the Gas Company, said that under section 30 of the Tramways Act the Gas Company had the right to require the promoters to lower or otherwise alter the position of their pipes if necessary. But it might be that the Company wanted protection. For instance, if there was a gas-main under the footway, and part of the footway was thrown into the road, the main would be very much nearer the edge, and would therefore need to be protected, either by a band of concrete or something of the sort. He therefore asked that the Gas Company should have power to require the promoters to protect their pipes. The clause also provided that, inasmuch as the Gas Company would have to superintend alterations to the gas-pipes, they should be able to claim the cost of superintendence from the Tramway Company. Provision was also asked that, if the gas-mains were interfered with for the purpose of widening the roads, the Tramway Company not being experts with regard to gas matters, the Gas Company should be able to make these alterations, but at the expense of the promoters.

Mr. MUNROE interposed with the remark that the promoters intended that this power should be given.

Mr. TYLDESLEY JONES, continuing, said that the clause also asked that, notwithstanding that a road be stopped up, the Gas Company were to have access to their mains. It was also asked that nothing in the Act should relieve the Tramway Company from liability for damage which the Gas Company might sustain in consequence of the working or running of motor omnibuses.

Mr. *Stephen Sellon*, a consulting engineer, speaking with regard to the cost of superintendence in connection with the alteration of the Gas Company's mains, said he saw no reason why, in effect, their servants should be paid by the Tramway Company. With regard to the damage which might be caused to the mains by the running of motor omnibuses, this was an entirely new departure, and introduced some difficulty. There were vehicles much heavier than motor omnibuses running over exactly the same roads as the motor buses, and no one could prove whether the buses did the damage or not. Further, the Tramway Company could not stand the cost of many fights in this connection.

Mr. TYLDESLEY JONES, cross-examining, said that in London County Council Bills clauses were put in distinguishing between widening streets and constructing tramways so far as gas-mains laid in the roads were concerned.

Mr. *A. E. Collins*, the City Engineer at Norwich, said he saw no reason for these suggested trimmings to the Act of 1870.

Mr. *W. H. Parr*, the Manager of the City of Norwich Water-Works, said he had not had any trouble with the Tramway Company in connection with the water-mains, and saw no reason for the suggested clause.

Mr. TYLDESLEY JONES having again briefly addressed the Committee, they finally passed the clause in the following form:

For the protection of the British Gaslight Company, Limited (in this section referred to as the "Gas Company"), the following provision shall, unless otherwise agreed in writing between the Company and the Gas Company, apply and have effect:—

(1) The provision of section 30 of the Tramways Act, 1870, as extended by this section, shall, so far as applicable, extend and apply to the execution of the street works, and to any works executed in connection therewith respectively in this section called "street works," as if the execution of such street works were the laying down or construction of a tramway. Provided that the right of the Gas Company under section 30 of the Tramways Act, 1870, in its application to street works, to require the lowering or other alterations of their mains, pipes, and apparatus (in this section called "apparatus"), shall be deemed to extend so as to authorize the Gas Company to require the shoring-up, or supporting and restoring or protecting of, any such apparatus which it may be reasonably necessary to shore-up, support, restore, or protect by reason of the execution of any works of the Company, or for preventing any interruption to the supply of gas by the Gas Company.

(2) If the Gas Company, before the date at which the Company are entitled to commence any street works which the Company may, under or in pursuance of this Act, or any Act incorporated therewith, be empowered or required to execute affecting, or relating to, any such apparatus, elect by notice in writing to the Company so to do, the Gas Company may themselves execute any such street works under the superintendence, and to the reasonable satisfaction of, the Engineer of the Company, and the amount reasonably expended by the Gas Company in so doing shall be repaid to them by the Company. But if for seven days after giving any such notice the Gas Company do not proceed with due diligence to execute any such street works as aforesaid, the Company may forthwith execute the same.

(3) Notwithstanding the stopping-up temporarily of any road or street under the powers of this Act, the Gas Company, their engineers, workmen, and others in their employ, shall at all times have all such rights of access to the apparatus of the Gas Company under any such road or street as they had immediately before such stopping-up, and shall be at liberty to do all such works at their own expense in, and upon, such road or street as may be necessary for inspecting, repairing, maintaining, removing, or extending such apparatus.

(4) Nothing in this Act shall relieve the Company from any liability for any damage which the Gas Company may sustain by, or in consequence of, the working or running of omnibuses and vans under the powers of this Act.

(5) Any dispute or difference which may arise between the Company and the Gas Company, or the Engineer to the Company and the Engineer to the Gas Company, touching any of the matters referred to in this section, shall, unless otherwise agreed, be determined by arbitration under this Act.

(6) The foregoing provisions of this section shall be in addition to, and not in substitution for, or derogation from, any other powers, rights, or privileges, whether statutory or otherwise, of the Gas Company.

The Bill was then sent forward for third reading.

HAYWARD'S HEATH GAS BILL.—BALCOMBE GAS ORDER.

Consideration of Clauses.

HOUSE OF COMMONS COMMITTEE.—Monday, June 29.

(*Before Sir* JOHN BARRON, *Chairman*, *Sir* J. HARMOOD-BANNER, *Mr.* MORELL, *and Mr.* DU PRE.)

The Committee had before them to-day the clauses dealing with the above measures.

Mr. CLODE, K.C., for the Hayward's Heath Gas Company, submitted a clause which he contended carried out the Committee's decision [see "JOURNAL" last week, p. 1053]. He explained that as the Balcombe area cut into both the 1s. differential district and the 6d. differential district of the Company, the clause provided that these differentials should be charged in respect of the two portions of Balcombe, or a lower differential if a lower differential was being charged in any other similar portion of the area. He believed that Mr. Jeeves, for the Balcombe Company, wished to compel the Hayward's Heath Company to always charge the maximum differential of 1s and 6d. respectively.

The CHAIRMAN said the Committee did not by any means intend that the price in Balcombe should be the full 1s. or the full 6d., but that it should be the same as the price charged in any similar area.

Mr. JEEVES said the position was this: It might well be that in the 1s. or the 6d. differential area no other district was being supplied at the time Balcombe was supplied. Therefore, in the matter of price there could be no criterion with any other similar district, and it would be open to the Gas Company to charge even as low a price as they were now charging in Hayward's Heath itself. His object in contesting this point was to prevent underselling in Balcombe, which he believed was also the object of the Committee.

The CHAIRMAN suggested that words might be inserted to the effect that so long as Balcombe was the only area supplied in the 1s. or 6d. differential areas these maximum prices should be imposed, but that as soon as other districts in the same differential areas were supplied, then the price in Balcombe should be governed by the price in these other districts.

This was agreed to by both parties.

Mr. CLODE, continuing to explain his clause, said that it also provided for the purchase of the Balcombe Petrol Air Gas Company's "plant, mains, and connections;" but Mr. Jeeves wished to include "premises" and "fittings." With regard to the former, he was not disposed to accept it, because it would involve the Hayward's Heath Company taking over the questionable site which the Balcombe Company were under an agreement to clear out of under certain terms. With regard to "fittings," however, he was quite content to have them added.

The CHAIRMAN said that the Committee deliberately meant to exclude "premises," but thought that the purchase should include "plant, mains, connections, and fittings."

Some discussion then took place as to the basis of purchase. The Hayward's Heath Company suggested that it should be "cost price, less depreciation;" but Mr. Jeeves objected to this, on the ground that if the purchase took place the plant would only have been in use about twelve months, and that there could not be any depreciation in this short period. He did not want, however, to take the risk of putting the matter before an arbitrator, and asked for the Committee's ruling.

The CHAIRMAN said he did not think the Committee could decide whether there might be depreciation or not; but the words "if any" might be added to the clause after the word "depreciation." It was also decided that the Balcombe Company should give one month's notice within twelve months of the passing of the Act of its desire for the Hayward's Heath Company to purchase.

Mr. JEEVES finally asked that the Cuckfield Rural District Council should have power under the Hayward's Heath Company's Act to enforce the general conditions of it for the benefit of consumers in Balcombe should the purchase of the Balcombe Company take place.

Mr. CLODE objected, on the ground that the Cuckfield Rural District Council did not appear, and that, further, the general public were well looked after under the Gas-Works Clauses Act.

The Committee took this view, and refused to adopt the suggestion of Mr. Jeeves.

A clause was added to the Balcombe Order providing that the passing of the Order should not give the Balcombe Company the right to oppose any application for powers to supply coal gas in the district.

This, of course, was inserted to cover the contingency of the Haywards Heath Company not giving a supply in the district.

CLAUSE RELATING TO THE PURCHASE OF THE BALCOMBE COMPANY'S UNDERTAKING.

(1) In this section the expression "the parish" means the parish of Balcombe in the rural district of Cuckfield, except the detached part of that parish lying to the north of the parish of Cuckfield rural and to the north-east of the parish of Slaugham, the expression "the Order" means the Balcombe Petrol Gas Order, 1914, and the expression "petrol gas" means petrol vapour mixed with air.

(2) For the protection of the Balcombe Company, the following provisions shall have effect:—

(*a*) If and so long as the Balcombe Company supply petrol gas within the parish under the provisions of the Order the price to be charged by the Company for gas supplied by them under the provisions of this Act to consumers within the parish shall be equal to the highest price for the time being charged by the Company for gas supplied by them for similar purposes within the area of which the part of the parish in question is situate, or if no gas is being supplied within such area other than the gas supplied within the parish then the maximum price which the Company are entitled for the time being under the provisions of this Act to charge in the area in question, and the gas so supplied by the Company as aforesaid shall not be supplied on terms, or subject to conditions, more favourable than those obtaining in the inner area, either as to the supply of meters, fittings, or otherwise howsoever.

(*b*) If the Balcombe Company shall within one year after the passing of this Act give to the Company notice in writing that they require the Company to purchase the plant, mains, connections, and fittings belonging to the Balcombe Company and used by them for the purposes of their undertaking under the Order, the Company shall, on the expiration of one month after receipt of such notice, purchase such plant, mains, connections, and fittings, at cost price, less depreciation (if any), and in case of any dispute as to the amount to be paid to the Balcombe Company, such amount shall be determined by an arbitrator to be appointed on the application of either party by the Board of Trade, and subject thereto in accordance with the provisions of the Arbitration Act, 1889: Provided that such arbitrator shall not award any sum in respect of any plant, mains, connections, or fittings laid, constructed, or ordered after the 26th day of June, 1914, except to meet a reasonably probable demand for a supply of petrol gas.

(3) From and after the completion of such purchase the Company shall continuously supply gas or petrol gas under the provisions of the Act or of the Order within the parish to at least so much thereof as was being supplied by the Balcombe Company at the time of purchase, and the Balcombe Company shall cease to supply petrol gas or any other gas within the parish.

DEAL AND WALMER GAS AND ELECTRICITY BILL.

HOUSE OF LORDS COMMITTEE.—Friday, June 26.

(*Before the Duke of* NORTHUMBERLAND, *Chairman, the Duke of* WELLINGTON, *the Marquis of* CAMDEN, *Lord* MANNERS, *and Lord* TWEEDDALE).

This Bill, which has already passed the House of Commons [see "JOURNAL," April 14 and May 5, pp. 125, 365], was disposed of in a few minutes.

Mr. W. SEDGWICK (Messrs. Rees and Frere, Parliamentary Agents) said that the Bill was promoted by the Deal and Walmer Gas Company, who have powers to supply gas in Deal and Walmer and a number of adjoining parishes. The principal object of the Bill was to obtain powers to supply electricity. As it went before the House of Commons, the Bill sought authority to supply electricity throughout the whole of the gas limits; but in consequence of opposition from local authorities the area of supply of electricity was confined to Deal and Walmer alone. The only petitioners in this House were the Sandwich, Deal, and Walmer Electricity Supply Company, Limited, whose powers the Gas Company were purchasing. The Electricity Company were in 1911 granted powers by the Board of Trade to supply electricity in Deal and Walmer; but they had not been able to raise money to exercise them. Negotiations had been entered into with the Electricity Company, but were not concluded when the Bill was deposited. Ultimately an agreement was come to, by which the Electricity Company transferred all their powers to the Gas Company, and consented to the repeal of their Order—the price to be paid being £1100. In the House of Commons the Bill was opposed by the local authorities on a large number of points. The Electricity Company, however, did not oppose; and it was alleged that the price of £1100 to be paid for the Electricity Company's powers was too high, although the Gas Company considered it reasonable. The decision of the Committee of the House of Commons was that £1100 was excessive. Accordingly a clause was inserted providing that within three months of the passing of the Act the Gas Company should pay £500 to the Electricity Company, who were thereupon to deliver all plans and specifications, &c. The Gas Company, however, wished to remain neutral in the matter, but felt that they could scarcely override the decision of the House of Commons Committee. They had communicated with all the local authorities who opposed in the other House, to the effect that they should ask the House of Lords to raise the £500 back to the original amount of £1100; but none of them had thought it worth their while to resist the amendment. He therefore asked the Committee to amend the clause to this effect.

Mr. *E. H. Hinds*, who is a Director of the Gas Company, a shareholder of the Electricity Company, and Chairman of the Walmer Urban District Council, said that the Gas Company were satisfied that it was worth their while to pay £1100 for the transfer of the electricity powers, and formally proved the preamble of the Bill.

Mr. CLODE, K.C., on behalf of the Electricity Company, corroborated the statements made by Mr. Sedgwick.

The CHAIRMAN asked whether this matter had been mentioned in any of the petitions against the Bill in the House of Commons.

Mr. SEDGWICK answered in the negative, but added that he did not think that at the time any of the opponents knew of the terms of the agreement.

Mr. *R. Mowll*, the Secretary of the Electricity Company, gave evidence that £1100 represented the full value of their powers.

The CHAIRMAN announced that the Committee would insert the amendment.

The Bill therefore went forward for third reading.

HIGHTOWN GAS AND ELECTRICITY BILL.

This Bill was last Wednesday sent forward for third reading by the Unopposed Bills Committee of the House of Commons. It has passed the House of Lords [see "JOURNAL," May 12, p. 444].

Mr. BUTTERWORTH (Messrs. Butterworth and Co., Parliamentary Agents) said that, apart from drafting amendments, there were one or two to which he ought to draw the attention of the Committee. In clause 6 of the Bill, which includes power to "convert, manufacture, and sell" residual products, the words "convert" and "manufacture" were deleted, and the word "recover" substituted, in order to meet the requirements of the ground landlord. Another amendment was made with respect to the clauses dealing with the quality of gas and testing for calorific power. These clauses were now in accordance with those adopted by the Liverpool Gas Company, as it was undertaken that they should be included when the Bill was before the House of Lords.

Mr. E. MOON, K.C. (Speaker's Counsel), said that the limit was 550 B.Th.U., which was higher than the normal; but he had been informed that the Liverpool Gas Company were going to supply the Company, and that this high value was imposed in the Liverpool case in view of the fact that the latter had a high illuminating power.

Mr. BUTTERWORTH, continuing, said that with regard to clause 51, which provided that the Company could enter into agreements with any "local authority, company, or person" for the supply of gas in bulk, an amendment had been made at the suggestion of Mr. Moon by the deletion of the words "local authority."

Mr. MOON explained that, according to his construction of the clause, it would give the Local Authority power to supply gas; and as they were very careful to see what powers local authorities obtained, he proposed the deletion of the words "local authority," as the power was not wanted, because the Local Authority were going to buy gas from the Company.

Mr. BUTTERWORTH, with reference to clause 63, which gave power to create a special purposes fund, said that this was to be struck out of the Bill. With regard to the price, which was to be 4s. per 1000 cubic feet, this had been agreed with the Local Authority.

MIDDLESBROUGH CORPORATION BILL.

The gas clauses in this Bill, which were passed by the Local Legislation Committee of the House of Commons in March [see "JOURNAL," April 7, p. 48], were formally approved by a House of Lords Committee last Tuesday.

LEGAL INTELLIGENCE.

ALLEGED PREFERENTIAL CHARGES AT ILFORD.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, July 3.

(*Before Mr. Justice* SARGANT.)

Attorney-General (at the Relation of the Ilford Gas Company) v. Ilford Urban District Council.

Mr. ROMER, K C., said the object of this motion [referred to in the "JOURNAL" for June 23, p. 992] was twofold—first, to restrain defendants from acting *ultra vires* in the carrying on of the business of supplying electric fittings. But so far as this branch was concerned defendants had given an undertaking over that day not to enter into any fresh contracts. The second branch was to restrain defendants from unlawfully preferring one class of consumers over another. The particular preference was this: The Council in December last adopted an additional tariff which was to apply only to premises electrically lighted throughout—that is to say, they were proposingto discriminate in favour of premises the owners or occupiers of which took the whole of their lighting energy from defendants. This was a discrimination clearly covered by the decision in the Long Eaton case; and was an unlawful discrimination under the Electric Lighting Act. A certain amount of evidence had been filed which was not of a technical nature; and he (Counsel) did not understand that defendants' witnesses adduced any real evidence to justify the discrimination—it was more a matter of argument than anything else. In these circumstances he was not quite sure what course defendant's Counsel proposed to take. If the parties could get an early trial, plaintiffs would be content to let matters remain *in statu quo* until the case was disposed of.

His LORDSHIP: Has the new scale come into force yet?

Mr. ROMER: Yes, since the 1st of January.

Mr. MARTELLI, K.C. (for the defendants), said as regarded the question of trading no doubt plaintiffs on an interlocutory application were entitled to an undertaking; and defendants were prepared to give one.

As to the question of preference, that was not covered by the decision in the Long Eaton case. He accepted the Long Eaton decision with the greatest loyalty; and the only question was whether the Court, on an interlocutory motion, would grant an injunction. The evidence was simply that defendants proposed to charge one scale where there was partly electricity and partly gas lighting. For instance, many public houses were lighted partly by gas and partly by electricity, and there was no certainty as to the regularity of supply. In the case of shops, the evidence showed that where they were lighted by gas and the house with electricity they were not such good customers as those who resided over shops, as shops and residences were not lighted at the same time.

His LORDSHIP: What are you going to do?

Mr. MARTELLI: We propose to leave the old rates standing. Anyone can go on the old rate.

Mr. ROMER said it used to be a flat-rate applicable to each person.

His LORDSHIP: I might be able to restrain a direct charge; but where there is only an indirect advantage to old customers I do not think the point can be disposed of on motion.

Mr. ROMER: They continue to supply everybody at the old rate, and give a preference to particular persons who use the electric light.

Mr. MARTELLI: We say the new rate has the same effect as the old rate; but people do not understand it.

Mr. ROMER: Defendants are introducing a differentiation between people electrically lighted throughout and those who are not.

His LORDSHIP: I do not think the matter is so urgent that it should be decided on an interlocutory application. Will the defendants continue the existing undertaking?

Mr. MARTELLI: Certainly.

His LORDSHIP: Then the motion will stand till the trial; the costs being costs in the action. When the pleadings are complete, an application can be made to fix an early date for the trial next sittings.

DISCS FOR PENNIES IN PREPAYMENT METERS.

Appeal Dismissed on a Technicality.

At the Manchester Quarter Sessions last week, before Mr. A. J. ATKIN, K.C., the Recorder, an appeal was made against the conviction of a woman for fraudulently obtaining gas through an automatic penny-in-the-slot meter by placing therein certain discs or tokens. The case was reported in the "JOURNAL" for May 5, p. 366.

Mr. WINGATE SAUL, K.C. (instructed by Mr. A. F. I. Pickford, of the Town Clerk's Department), represented the Corporation of Manchester; and Mr. E. T. NELSON (instructed by Messrs. G. L. Welford and Sons, of Manchester) was for the appellant—Margaret Smith, otherwise Hargreaves, of Chorlton Road, Hulme.

Mr. SAUL, at the outset of the case, took two preliminary objections—one that the service of the notice was bad, and the other that the appellant had appealed under the Gas-Works' Clauses Act, 1847, whereas the conviction was under section 38 of the Gas-Works' Clauses Act, 1871. The woman, he said, was convicted of fraudulently abstracting gas from a meter, and she was prosecuted by Mr. Robert Hewitt, a gas-meter inspector to the Corporation. Counsel's contention was that the notice of appeal should have been served on Mr. Hewitt, and not upon (1) the Town Clerk of Manchester, and (2) the Clerk to the City Justices.

Mr. NELSON said he was only instructed the previous evening, and consequently the notice did not pass through his hands. He, however, submitted that, as Mr. Hewitt was a servant of the Corporation, it was sufficient to send it to the Corporation. At the same time he could not understand a rich Corporation like that of the City of Manchester making such an objection, and he thought it should be waived.

The RECORDER remarked that he did not think the Corporation were bound to waive any objections they might be entitled to take. Counsel must, of course, recognize that it was hopeless. The appeal, said the Recorder, would be dismissed, with costs, on the preliminary ground that the service was bad.

Lancaster Gas Prices.—The Gas Committee of the Lancaster Town Council have fixed the following charges for gas to large consumers for other than motive power purposes: Up to 5,000,000 cubic feet, 1s. 10d. per 1000 feet; 5,000,000 and under 10,000,000 cubic feet, 1s. 9d.; above 10,000,000 cubic feet, 1s. 8d. The London and North-Western Railway Company had applied for a reduction in the price of gas for lighting the Castle Station.

Halifax Gas Charges.—The following scale of charges has been recommended by the Gas Committee of the Halifax Corporation for adoption as from July 1, 1915, with reference to gas supplied outside the borough: Lighting, &c.—For every 1000 cubic feet of gas consumed per quarter 2s. 6½d. per 1000 feet; accounts for 220,000 and under 450,000 cubic feet, 2s. 5½d.; accounts for 450,000 and upwards, 2s. 4½d. Gas-engines—Accounts under 220,000 cubic feet per quarter, 2s. 3½d. per 1000 feet; accounts for 220,000 and under 450,000 cubic feet, 2s. 2½d.; accounts for 450,000 and upwards, 2s. 1½d.—subject to an allowance of 1d. per 1000 cubic feet if the accounts are paid within the prescribed period.

Ilkeston Gas Supply Area.—The parish of Shipley, after which the collieries owned by Mr. Miller Mundy are named, is to be brought within the scope of the Ilkeston Corporation gas undertaking; an arrangement having been entered into to supply 6½ million cubic feet of gas. Mr. Mundy, as the owner of the parish, has, to safeguard his interests, made it a condition of the contract that the arrangement shall not be used as an argument in favour of any scheme of borough extension. The Corporation have acquiesced in the terms; but it is scarcely conceivable that Ilkeston can be circumscribed for an indefinite period within its present restricted area, and in the event of the Municipality seeking powers to extend their borders there is the condition imposed that the contract with the owner of Shipley parish may be terminated by six months' notice.

MISCELLANEOUS NEWS.

LOCAL GOVERNMENT BOARD AND STEEL MAINS.

British Mannesmann Company's Views.

The British Mannesmann Tube Company, Limited, of Salisbury House, E.C., have forwarded a copy of a pamphlet setting forth their views on the Steel *v.* Cast-Iron Main controversy. The pamphlet includes a reprint of the editorial in the "JOURNAL" for March 10 last, on the "Local Government Board and Steel Mains," which was written when the Board were in communication with the Tredegar Urban District Council on the subject of a loan for mains. The stipulation of the Board, as explained in a letter published on p. 370 of the "JOURNAL" for May 5 last, was that "no payments be made for Mannesmann steel tubes out of the amount now sanctioned." This stipulation, the Board explained, merely had reference to the fact that the loan was for thirty years, whereas the period for which they would sanction a loan for steel tubes would not exceed fifteen years. They emphasized the fact that it was not their intention to prohibit the use of Mannesmann steel tubes.

The British Mannesmann Company, in their pamphlet, give a page (selected at random) of titles and extracts of press cuttings referring to fractured cast-iron pipes; and there is also an eloquent table giving experiences at over twenty named places in the matter of the life of Mannesmann tubes. With reference to the letterpress itself, the Company remark that the coming of Mannesmann steel tubes "is part of the inevitable advance in engineering practice which is taking place during the present generation. Steel must take the place of cast iron for gas and water mains as surely as it has replaced timber for the building of war and merchant vessels. The reasons are not very far to seek. Increase of pressures within the pipes, and heavier traffic causing enormous vibration without, make it extremely dangerous to use so brittle a substance as cast iron for the conveyance of gas and water, either in town or country. There is very little doubt that if drawn steel tubes had been available a century ago the use of a brittle material like cast iron would never have been tolerated. Cast-iron pipes have had their day and enjoyed a practical monopoly in times that are now old-fashioned. Steel has, in fact, come to the pipe-making industry comparatively late, considering the position it holds in other branches of engineering practice. It is not surprising, therefore, that in a few years such rapid progress has been made."

As to the durability of iron and steel, they say: "So far the few examples given where steel pipes have failed after a number of years in use are taken from foreign countries. In no case yet quoted do we find that the tubes were supplied by the Mannesmann Company; and it will probably be found that the conditions are such that either iron or steel will tend to rust if unprotected. We believe that some harm has been done to the cause of steel tubes by firms supplying thin welded pipes abroad without suitable coating or wrapping. It is not necessary to supply steel pipes of the same thickness as cast iron, owing to the great superiority of steel in tensile strength; but there is a reasonable minimum thickness which has been adopted by the Mannesmann Company, and which has been consistently adhered to for many years. The asphalted wrapping is added to ensure complete protection of the tubes from any influences which might tend to rust the shell. Any arguments designed to scorn the idea of a protective coating for steel tubes will apply equally to steel girders and bridges, and all classes of constructional ironwork, including the hulls of ocean vessels.

"Upon the subject of corrosion, as with many other subjects, it is not wise to argue too much from special cases. Instances where steel tubes have outlived cast-iron, under the same conditions, can be quoted as readily as the contrary; and to prove this we append a schedule of such cases. Several most interesting examples are given where cast-iron pipes and Mannesmann tubes have been actually laid in the same soil, and that of a corrosive nature. The cast-iron pipes failed, while the steel tubes were unaffected. Our opponents admit that cast-iron is not free from the liability to corrode; and we are also willing to make the same admission for steel. But we contend that the high quality of steel that has been put into Mannesmann weldless tubes for the last twenty years is the least liable to corrosion of all the various combinations of iron known as wrought iron, cast iron, and steel. Added to this, the asphalted jute covering should give the tubes a life far exceeding the records of cast iron. It is not possible to move the clock of time on for a fifty or one hundred years' test of any material. If it were, the Mannesmann Company would see the only possible argument against their tubes—and that a hypothetical one—honourably removed. All the rest of the argument weighs heavily in the favour of steel. Weldless tubes have six times the tensile strength, six times the bursting strength, and three times the length of cast-iron pipes (making for fewer joints). They admit of better jointing, are absolutely impermiable by water or gas, and have at least 20 per cent. more carrying power. The actual tensile strength of Mannesmann tubes is from 37 to 41½ tons per square inch, and that of cast iron is from 6 to 7 tons."

The Company deal as follows with colliery districts: "If any proof were required as to the superiority of weldless steel tubes in districts liable to subsidence, it is afforded by experiences in practically every town in a colliery district throughout the country. The Brierley Hill Gas Company replaced a cast-iron main (which had been giving daily trouble through breakage, &c.) with weldless steel tubes, and twelve months later the engineer was able to report that, although the ground had since sunk over 12 feet, he had only to repair or set-up about seven joints. The Durham Gas Company replaced a cast-iron main (which had been a source of endless trouble and expense) with weldless steel tubes; and though the cast-iron main had to be repaired daily, the result of the introduction of weldless steel tubes was an entire cessation of leakage. The Longton gas manager has stated that since replacing, four or five years ago, a cast-iron main (which has given constant anxiety and expense through fractures and drawn joints) with

weldless rigid-jointed tubes, he has not had to open the ground for a single escape. At Tredegar, in South Wales, cast-iron mains have burst owing to landslips, depriving a population of 30,000 of their water supply. Twelve months ago a 9 inch weldless steel main was put in, and is now in perfect condition, although the adjoining cast-iron pipes are continually giving out, causing damage to the roads, and necessitating the constant attention of a staff for watching and repairing work."

After alluding to cost, electrolysis, and other matters, some remarks are made on the attitude of the Local Government Board: "The attitude of the Local Government Board in granting loans for steel tubes on less advantageous terms than for cast-iron pipes is frequently referred to. The loan period allowed for cast iron is thirty years; for steel twenty years; and for steel tubes tapped only fifteen years. Recently, in reference to the case of Tredegar, some correspondence with the Engineering Department of the Local Government Board was widely published in the Press, which gave the impression that steel tubes were wholly banned. This was afterwards corrected; but the fact of the loan period remains, and in many cases operates as a difficulty in the way of the smaller urban councils who are dependent on State loans for their capital expenditure. In mining districts, however, where cast-iron pipes have to be repaired almost daily, it would be financially economical to put in Mannesmann weldless tubes, even if the loan period were ten years. Although the Local Government Board's policy may be described as one of caution in regard to a new material, it can scarcely be accepted without protest by those who either have the practical experience of steel used in other spheres, or who realize the important place it is taking in the distribution of gas and water. In the meantime, the years are passing. Time and experience are gradually overcoming prejudice, The quantity of Mannesmann tubes already laid in Great Britain approximates 2000 miles; and the whole output of spigot and faucet tubes supplied by the Mannesman concern to all countries is sufficient to double the circumference of the earth. Therefore it cannot now be long before the Local Government Board falls into line with modern practice, and, in granting loans for the distribution of gas and water, places steel at least on the same footing as cast iron."

LAMPS OVERHANGING THE PUBLIC WAY.

Bye-Laws of the London County Council.

At the Meeting of the London County Council last Tuesday, the Building Acts Committee presented a report on the subject of the regulation of lamps, signs, or other structures overhanging the public way. It was accompanied by a series of amended bye-laws which were submitted for the Council's approval, and for confirmation at a subsequent meeting. On this being done, the Local Government Board will be asked to sanction them, and to fix a date for their coming into force. The following are extracts relating to lamps.

A person shall not, after the date at which these bye-laws come into operation, fix or fit any lamp or any structure supporting or carrying the same, nor shall he retain any lamp or structure supporting or carrying the same fixed or fitted after such date so as to overhang the public way in such manner that any part of such lamp or structure respectively shall be at a less height than 8 feet clear above the surface of the footway immediately under such lamp or structure, or be nearer to the carriageway than 2 ft. 6 in. from the outer edge of the kerb, or project more than 5 feet from the wall or shop front of the premises or the post or upright support to which it is attached.

It is provided that this bye-law is not to apply to the re-erection or replacement of any lamp or structure supporting or carrying the same which has been fixed or fitted before the date of confirmation of the bye-laws, if the interval between the removal and the re-erection or replacement does not exceed six months; to any lamp or structure supporting or carrying the same which is substituted for a lamp or structure which has been fixed or fitted before the date of confirmation of the bye-laws, if the interval between the removal of the one and its replacement by the other does not exceed six months, and the substituted lamp or structure does not exceed that for which it is substituted in weight or dimension, and does not in situation contravene the bye-law to a greater extent than the lamp or structure for which it is substituted.

A person shall not, after the date at which these bye-laws come into operation, fix or fit any lamp which, including framework and ornaments, exceeds 3 feet in any part when measured in any direction horizontally, or which, including framework and ornaments, exceeds 5 feet in height, or which weighs more than 84 lbs.; nor shall he retain any such lamp so fixed or fitted after such date so as to overhang the public way. Any lamp which may lawfully be fixed or fitted under this bye-law shall be provided with a secondary means of security of sufficient strength to sustain safely the whole weight of the lamp against falling away from its support.

A person shall not fix, fit, or erect any lamp, sign, or other structure coming within the terms and provisions of these bye-laws unless and until seven clear days' notice in writing of his intention to fix, fit, or erect such lamp, sign, or other structure shall have first been given to the local authority.

The Council, after consultation with the local authority, may, in any case in which they may consider it expedient so to do, dispense with the observance of any of the bye-laws on such terms and conditions (if any) as they may think proper.

Any person who commits any offence against any of the bye-laws shall be liable for every such offence to a penalty of £5, and a daily penalty of 40s. for every day during which such offence continues after conviction. But the Court of Summary Jurisdiction before whom any proceedings may be taken in respect of any such offence may, if the Court think fit, adjudge the payment of any sum less than the full amount of the penalty imposed by the bye-law.

The bye-laws are not to apply to: (1) Any lamp or structure supporting or carrying the same overhanging the public way which may be fixed or fitted at not less than 7 ft. 6 in. in the clear above the surface of the footway immediately under such lamp, and so as not to project in any part from the line of the window-frame of the shop more than 3 feet, and so as not to be nearer to the carriageway than 2 ft. 6 in. from the outer edge of the kerb, and which shall be solely for the purpose of illuminating such windows from without; the lamp itself not to exceed 36 inches in height, 24 inches in width parallel to the face of the building, and 24 inches in depth from front to back of the lamp in clear, including any ornamentation and chimney. (2) Any gas rail or pipe overhanging the public way used for the purpose of illuminating shops from the outside which has not a greater projection than 2 feet from the shop front, and which is not less than 7 ft. 6 in. above the surface of the footway immediately under such rail or pipe. (3) Any lamp provided by a local authority for the purpose of lighting a street.

BAHIA BLANCA GAS COMPANY, LIMITED.

The report submitted at the seventh ordinary general meeting of this Company (which was held at the London Offices, No. 1, East India Avenue, E.C., last Thursday) stated that the accounts for the year ended Dec. 31, owing to the continued high cost of coal and freight, showed a loss of £537—making, with the debit of £378 brought forward from 1912, a net debit balance of £915. The total receipts in Bahia Blanca during the past year increased by £1333, and the expenditure by £1012; while a result of office and other re-arrangements had been a decrease of £1281 in London charges. Interest on the loan from the Company's bankers required to carry on the business amounted to £1839—an increase of £525. The total amount of gas sold in the year was about 46¼ million cubic feet, as against 43½ million feet for 1912, and 39¼ millions for 1911. This was considered satisfactory, taking into account the bad state of business generally. High-pressure gas lighting continued to give satisfaction to the consumers; there being now 67,500-candle power in constant use. A few extensions of mains had been effected to meet the demands for this system of lighting. Lamps on hire and maintenance at the close of the year numbered 308, and cookers out in service 587. In order to attend to the requirements of the consumers, a new show-room had been obtained in the best thoroughfare in the city, which, it was anticipated, would be of great service to the business of the Company. The City of Bahia Blanca had unfortunately been seriously affected by the general depression due to the continuance of very bad harvests, though rains having now fallen heavily the prospect was again more hopeful.

In moving the adoption of the report, the Chairman (Mr. J. C. im Thurn) expressed regret at the fact that the result of the year's working was a debit; but the continued high cost of coal and freight had rendered this unavoidable. The actual working of the business in Bahia Blanca had shown an improvement during the course of the year under review; the total gas sales having been greater than in any previous year. The net result was that there had been an increased profit in Bahia Blanca of £320; while the re-arrangement of the charges in London, and the fact that the Directors had during the past year accepted only one-half of their fees, had lessened the office expenses by £1281. But, on the other hand, the amount of £1838 for interest on loan was a serious item. The matter of taking up this loan by the issue of debentures had been under consideration; but the times had been such that it had not been possible to carry the scheme into effect. Every effort was being made to conserve the interests of the Company by their able and active Manager (Mr. A. M. Hunter); and in order to take advantage of every opportunity to push the use of gas, some extra expense was incurred in the early part of 1913 by the endeavours to give the business an additional impetus in anticipation of the good harvest that was expected up to the middle of November last. Owing, however, to want of rain, these expectations were again disappointed, and as a consequence business in the city had been worse than ever previously. Competition with electricity had also been very severe; but high-pressure gas lighting had increased in favour with the consumers, and the Manager reported that had the prospects of the harvest continued good very satisfactory advances would have been made in this line. At the close of the year there was a total of 67,500-candle power being developed nightly by this system, which lighting, without its use, the Company would certainly not have been able to retain. A high state of efficiency was maintained, and progress was steadily made, with satisfaction to the consumers. In this, as in other respects, he felt assured that the Company was among the best administered gas undertakings in South America. Its present position was due to the bad state of business in the town, which depended upon the harvests, for which it was the exporting port. During the year, nearly 2 miles of mains, in the form of small extensions, had been laid, to pick up good consumers who had made application for gas. The Municipality had lately requested the Company to lay additional mains in order to light by gas the new district of Bella Vista; and the matter was receiving attention. There were signs that the period of very high coal prices was passing, and it was hoped that more reasonable freights might be secured in the future. Relations with the Municipality continued to be cordial; and he did not see that anything more could be done than to maintain the whole of the apparatus and staff of the Company in the high state of efficiency in which it stood to-day. As usual, the works and mains had been maintained out of revenue; and the Manager had written that nothing would be wanted for the next two years. As soon as business improved, the Company would be fully able to deal with all possible demands that might arise. He wished to put on record the Board's appreciation of the work done by the Local Committee, the General Manager, and the whole staff in Bahia Blanca. Their energies had been exercised to the uttermost in conserving the position of the Company, in securing what new business had been possible, and in taking every care to prevent bad debts. From advices which had been received, he was convinced that it was only by the zeal and care shown by the management that the Company had been able to get through so well; and it was only right that this should be recognized by them in London.

After a short discussion, the report was unanimously adopted.

ELECTRIC MAINS EXPLOSIONS.

Report of the Board of Trade Committee of Inquiry.

In December of last year, the Board of Trade appointed a Departmental Committee "to consider the causes of explosions which have occurred in connection with the use of bitumen in laying cable-mains at Nottingham, Hebburn, and elsewhere, and to report as to any steps which should be taken to prevent explosions in future from the use of this or similar substances." The members of the Committee were: Sir T. Edward Thorpe, C.B., F.R.S. (Chairman), Mr. Robert Nelson, Mr. W. Slingo, Mr. James Swinburne, F.R.S., and Mr. Alexander P. Trotter—with Mr. M. J. Collins as Secretary. The two cases specifically alluded to in the reference have been frequently alluded to in the "JOURNAL." The explosion at Nottingham (which was at the Albert Hotel) took place on Nov. 26, 1911, and that at Hebburn, on March 30, 1913. After hearing a great deal of evidence, the Committee prepared a report, and this was published last week.

INTRODUCTORY.

In the introductory portion of the report, the Committee say: During the past eleven years, some six or seven serious explosions have taken place in houses, due to the ignition of vapour generated by short-circuits between electric cables laid underground in the streets. These have caused the death of two persons, and injury to seven others. Explosions have occurred from similar causes in manholes or street-boxes. Nine or ten persons have been injured by these. There have been many cases of minor explosions, which have merely raised the lids of manholes or have disturbed the pavement. There have been also explosions in electric street-boxes due to the accumulation of coal gas from leaks in defective gas-mains. In investigating the causes of these explosions, the Committee found that no serious cases have been recorded, nor could witnesses adduce instances, where the supply was given by alternating current, by concentric mains, or by lead covered paper-insulated cables; and evidence showed that three-core cables may be added to this exclusory list. There remain the classes of single-core separately-laid cables insulated with india-rubber or with vulcanized bitumen. Although at one time vulcanized rubber cables of excellent quality were made, and it appears might still be made at a higher price, inferior qualities have given trouble. The explosion at Manchester in May, 1903, was concerned with such cables, laid in bitumen. Vulcanized bitumen has been the material used for insulating the cables in all the cases of serious explosions in houses; and these have been drawn into bitumen casing, or have been laid in bitumen on the "solid system," which consists in a trough of wood, iron, or stoneware in which the cables are laid, spaced or supported by bridges or separators. Melted bitumen or pitch-compound is poured in, covering the cables; and bricks, tiles, or wood planks are laid on it while the bitumen or pitch-compound is hot.

While mains have been laid in many thousands of miles of streets with separate cables on the solid system, and the serious accidents which have occurred through explosions have not been numerous, it appears that gradual deterioration sometimes takes place owing to original defects in the method of laying, or to injury inflicted on the cables in the course of other work in the street—such as alterations of gas-mains, &c. It is not always possible, after a serious accident, to determine which of these causes has led to the breakdown. Sometimes the defect has been local, and sometimes considerable lengths of cable have deteriorated. Failures have occurred on cables which have been laid for ten or twenty years; but on taking them up the bulk has been found to be in perfect condition. Continuing the process of exclusion, the Committee found that serious explosions—with, perhaps, one exception—have not occurred in small towns. There is reason to suppose that this may be due to the use of small cables having comparatively high resistance rather than to the use of small generating plant. The use of pitch-compound instead of bitumen has developed to a sufficient extent to justify the view that serious explosions do not occur when such material is used for filling on the solid system. Neither bitumen nor pitch-compound is intended to act as an insulator, but to prevent access of water and gas, and as a mechanical protection.

FAULTS ON VULCANIZED BITUMEN CABLES.

After enumerating the three causes which give rise to deterioration of vulcanized bitumen cables, the Committee, referring to consequent short-circuiting, say: Where the resistance of the cables is sufficient to control the current, the heat may only melt the surrounding bitumen, which flows in, quenches the arc, and seals the fault. If, on the other hand, the arc persists, the vulcanized bitumen and the bitumen in which the cables are laid are melted. Both vapour and gas are given off. At the high temperature which is present, the vapour is "cracked" or dissociated into gas in considerable volume, and if in a confined space, under considerable pressure. When these products can force their way and escape through the surface of the roadway or between the joints of paving stones, there is a chance that the arc may burn itself out, either by flooding of bitumen or by failure of current consequent on the lengthening of the arc owing to melting and volatilization of the copper. If owing to an impervious pavement the gas is forced, or if having free access it passes, into a house and becomes ignited, an explosion may be the result.

BITUMEN AS A FILLING.

The classes of cables which do not cause explosions are indicated; and then attention is turned to bitumen as a filling. Bitumen casing is now no longer manufactured, but considerable quantities remain in use in districts where no accident due to bitumen gas has occurred. Careful subdivision of districts and testing for localization and repair of faults in cables drawn into them, seem to account for absence of trouble. This narrows the matter to the consideration of the filling-material used on the solid system, and the troughs into which it is poured. It must be admitted that bitumen and pitch-compound are the only practical materials that can be used to fill the troughs. The advantages of bitumen are that, since it undergoes a process of preparation, it can be supplied of a quality which is claimed to liquefy at a practicable temperature, to run freely, to weld itself to a subjacent layer, to adhere firmly to cables and to the right kind of bridges, and to retain at temperatures above freezing-point such viscosity that in case of subsidence of the ground it will bend slowly without fracture, or, if cracked, will re-unite. So long as it is continuous it protects the cable from moisture. The temperature recommended for pouring is between 250° and 350° Fahr. If it is heated above 400° Fahr., hydrocarbons are driven off, and it becomes brittle; but some engineers have found it difficult to make a good job unless the bitumen was run at about 420°. Mains to the value of £2,500,000 to £3,000,000 are said to have been laid in this way.

PITCH AS A FILLING.

The alternative to bitumen, the Committee proceed, is pitch. Blast-furnace-pitch contains substances which make it unsuitable. Coal-tar pitch by itself is too brittle, though it has been used successfully for forty years for protecting lead pipes. Experiments in tempering it with oil, and afterwards strengthening it with whinstone dust, were encouraging, and resulted in one case in a mixture of 3 tons of pitch to 2 tons of stone dust and 10 gallons of pitch or creosote oil. In another case, 10 cwt. of pitch, 10 cwt. of limestone dust, and 10 gallons of tar oil were used. This pitch-compound was tested in a cement-testing machine, and was found to be as tough as bitumen. The chief advantage claimed for this over bitumen is cheapness. The melting-point is lower; it can be run at 260° Fahr. This lower temperature, and the fact that the specific heat of pitch is about 0·5, as against 0·8 for bitumen, have the advantage that the cables over which it is poured are not so likely to be overheated. On a damp day hot bitumen froths up; and unless considerable care is taken, the copper core expands and the cables writhe and buckle. Pitch-compound holds firmly to unglazed stoneware bridges. It is apparently not affected by creosote or by coal gas. While more gas is given off on heating pitch than on heating bitumen, only two minor explosions of street-boxes have been recorded where pitch has been used; and it must be remembered that street-box explosions are often due to the sudden expansion of air by the heat of a heavy short-circuit. Evidence about the cracking and the self-healing properties of pitch compared with bitumen was directly contradictory. Perhaps credit may be given to the advocates of each for understanding the advantages of their favourite method.

CONTRIBUTORY CAUSES.

Attention is given to the material for the troughs; and then the Committee go on to say: The Hebburn accident was due to three preventable causes. At a corner where the direction changed 40°, wooden troughs were merely mitred together. (*a*) Not only had the two cables been pulled up against the wood, but the outer one had been pulled until it rode over the other, and so remained for eleven years, when a fault developed. (*b*) An impervious continuous cement pavement was laid over the cables. (*c*) The cables were laid close to the foundations of a house, consisting of loose rubble with no lime or cement.

In most cases where explosions have occurred, an impervious pavement of concrete or asphalt had been laid over the mains. It is found that with a flagged pavement the gas can escape between the joints. The nature of the pavement should be taken into account in considering the use of a solid system employing bitumen. The inducement to lay mains close to the houses depends on local circumstances. The desire to save in services, and to avoid crossing gas and water pipes, seem to be the only reasons. In three cases of explosions, services have been so laid that access was given to the interior of houses, and gas freely entered. Most witnesses agree that services should be solidly bricked-in; armoured cable being generally preferred. There was general agreement that services should not be carried in on the solid system.

OTHER MATTERS.

Reference is made to testing and insulation; it being remarked that the testing of the insulation of a distributing network of mains has a bearing on breakdowns and on accidents arising therefrom. Also to a method of observing leakages rather than testing insulation. Finally, attention is directed to breaking-down or burning-out faults, and to districting and fuses.

CONCLUSIONS.

I.—The Committee find that the explosions to which their attention has been directed have occurred in connection with electric supply by continuous current through separate cables, for the most part insulated with vulcanized bitumen, and either drawn into bitumen casing or laid solid in troughs filled with bitumen.

II.—The Committee find that no serious explosions have occurred where the supply has been by alternating current, or where concentric or three-core, or lead-covered paper-insulated cables have been used, or where cables have been laid solid in pitch-compound; but a direct comparison between bitumen and pitch-compound cannot be made, as the former material has been more extensively used than the latter.

III.—In view of the small number of serious accidents which have occurred, compared with the large extent to which vulcanized bitumen cables laid solid in bitumen have been used, the Committee are unable to recommend the Board of Trade to discontinue to approve of this system.

IV.—In view of conflicting opinions of witnesses, the Committee cannot recommend that iron or stoneware troughing should be used, to the exclusion of wood. But they recommend that wood troughing should be used only where it can be ascertained that the soil is suitable; that where separate mains are laid in troughing, each cable should be laid in a separate trough; and that between the troughs there should be a space not less than 2 inches tightly packed with earth or sand.

V.—The Committee recommend:

1.—That separate mains for continuous current supply should not be laid on the solid system below impervious pavements or close to the walls of houses.

2.—That easy bends should be laid at corners, and the bitumen or pitch-compound should be poured after the straight lengths have cooled.

3.—That where sharp corners of troughing are suspected to exist the mains should be opened up and the corners eased.

4.—Services should be taken into houses (preferably by the use of armoured cables) in such a manner that gas cannot enter.

VI.—The Committee also recommend that the special attention of engineers of electric supply undertakings should be called to section 38 of the schedule to the Electric Lighting (Clauses) Act, 1899, and to No. 12 of the regulations made by the Board of Trade for securing the safety of the public, which require notification of accidents by explosion or fire, or any other accident of such kind as to have caused, or to be likely to have caused, loss of life or personal injury, which have occurred at any part of any electric line or work, in order that the circumstances may be investigated, and, when necessary, reports made on them.

VII.—The Committee are strongly of opinion that such reports should be published for the information of those concerned.

Appendix.

Bitumen Gas Explosions.

In an appendix to the report, there is given a communication made from the Home Office Experimental Station at Eskmeals, by Mr. R. V. Wheeler, who says that a memorandum of Mr. A. P. Trotter, which outlines the history of recent explosions due to the ignition of vapours and gases generated from insulating materials by short circuits between electric cables laid underground, concludes with the following sentences: "I should be glad to know (1) Whether spontaneous ignition of finely-divided carbon or of hydrocarbon gases generated in the circumstances described is possible. (2) In what proportions gases generated in such circumstances are explosive. (3) Whether pitch toughened with pitch oil—*e.g.*, as used by the Corporation of Glasgow—is less dangerous than refined Trinidad bitumen."

During July of this year, several samples of bitumen and insulating material, including a composition of pitch and whinstone dust used by the Glasgow Corporation, were received from the Board of Trade for testing purposes. Tests have been carried out on the following materials: (1) "Callender" bitumen. (2) "New" bitumen. (3) Callender-Webber casing. (4) Glasgow pitch. (5) Pitch and whinstone dust composition. The main object of the tests made was to obtain some idea of the nature and volume of the gases evolved from the various materials when heated at different temperatures and under different conditions, and to ascertain their explosive properties when mixed with air. Several methods of testing were adopted. One series of experiments involved the destructive distillation at different temperatures of the different materials in such a manner that there was no continued heating of the gases and vapours, but collection of the gases and condensation of the vapours as soon as they were evolved. In another series the vapours and gases were caused to pass through a column of porous porcelain heated to a high temperature, and were thus "cracked" before being collected. As a result of the experiments, Mr. Trotter's questions can be answered as follows:

1.—No evidence could be obtained of any liability to spontaneous combustion on the part of the finely-divided carbon that arises from decomposition at high temperatures of the hydrocarbon gases evolved from bitumen and pitch. A supply of such carbon was obtained during experiments in which the gases were caused to pass over heated porous porcelain, and samples of it were exposed to streams of air and of pure oxygen at different (low) temperatures, without it showing any tendency to "self-heat."

It can, however, be taken for granted that if any combustible gas be heated to a sufficiently high temperature before being allowed to issue into the air, it will "spontaneously" ignite. Rough experiments with coal gas showed that, if passed rapidly through a porcelain tube packed with porous porcelain and heated to a high temperature, the hot gas, which would have a temperature of about 800° C., ignited as soon as it mingled with comparatively cool air.

2.—The limits of inflammability of the gases evolved on heating bitumen and pitch depend upon their composition, which varies with the temperature at which they are evolved. The gases evolved at 1000° C. without cracking have the following limits of inflammability:

	Lower Limit.	Upper Limit.
Gas from bitumen	5·4 per cent.	20·5 per cent.
Gas from pitch and whinstone dust composition	10·7 ,,	47·5 ,,

Thus, any mixture of air and the particular sample of bitumen gas tested that contains between 5·4 and 20·5 per cent. of bitumen gas is capable of self-propagation of flame; while in the case of the gas evolved at 1000° C. from the pitch and whinstone dust composition, the limits lie wider apart—any mixture of air and the gas containing between 10·7 and 47·5 per cent. of gas is capable of self-propagation of flame.

When the gases are "cracked" by passing them over a highly-heated surface, the percentage of hydrogen in them increases at the expense of the hydrocarbons. This tends to widen the limits of inflammability. As will be seen later, the "cracked" gas from bitumen does not differ very widely in composition from the "cracked" gas from the pitch and whinstone dust mixture. Their limits of inflammability will also, therefore, be similar.

3.—The gases evolved from (*a*) Callender bitumen, (*b*) Glasgow pitch, and (*c*) pitch and whinstone dust composition, at 1000° C. without "cracking," have the following analyses:—

—	(*a*)	(*b*)	(*c*)
Hydrogen sulphide, Carbon dioxide	3·95	2·70	8·10
Benzene, Ethylene hydrocarbons	12·75	0·75	1·15
Carbon monoxide	15·10	13·00	41·70
Hydrogen	37·40	70·00	37·30
Methane	18·00	8·15	7·45
Ethane	10·60	0·80	0·50
Nitrogen	2·20	4·60	3·80

No experiments were made regarding the limits of inflammability of the gas derived from pitch alone; but the fact that it contains as much as 70 per cent. of hydrogen would render its limits wider even than those of the gas from the whinstone dust mixture.

The volumes of gases evolved from each of the three materials at 1000° C. were as follows:—

—		(*a*)	(*b*)	(*c*)
Volume of gas evolved at 1000° C., measured at N.T.P.	C.c. per gram. or Cu. ft. per lb.	194	157	174
		3·1	2·5	2·8

There is, therefore, not much to choose between the materials as far as the volumes of inflammable gases evolved are concerned.

On the whole, it would appear that pitch would be, if anything, a more dangerous material than bitumen from the point of view of possibility of explosion from the gases derived from it. For the limits of inflammability of the gas are wider apart than those of bitumen gas generated under the same conditions, and the hydrogen it contains would render explosions more violent. The pitch and whinstone dust composition can also be regarded as more dangerous than bitumen, not only on account of its wider limits of inflammability, but on account of the high percentage of poisonous carbon monoxide that it contains.

It must be noted, however, that if "cracking" of the gases is presumed to take place the difference in composition between bitumen gas and pitch gas largely disappears; so that the limits of inflammability of the two kinds of gas become similar. Thus, the analyses of Callender bitumen gas and of the gas from the pitch and whinstone dust composition when "cracked" at 1000° C. are as follows:—

	Callender Bitumen.	Pitch and Whinstone Dust.
Hydrogen sulphide, Carbon dioxide	3·05	2·50
Benzene, &c.	0·85	0·15
Carbon monoxide	19·60	35·05
Hydrogen	59·80	58·00
Methane	4·30	0·40
Ethane	5·45	Nil
Nitrogen	6·95	3·90
Volume of gas at N.T.P. C.c. per gram.	454	381
Volume of gas at N.T.P. Cu. ft. per lb.	7·3	6·1

It will be observed that the gas from the pitch and whinstone dust still contains a high percentage of carbon monoxide.

A series of experiments was made with Callender bitumen, which are of interest in showing the changes that take place in the composition of the gases evolved as the temperature of distillation is increased. The distillations were made in such a manner that there was no overheating or "cracking" of the vapour and gases; and records were taken of the volumes of gases evolved and of the percentages of "total volatile matter" and of "tarry matter" that were driven off at the different temperatures. The results are summarized in the table that follows.

Temperatures of Distillation ° C.

Gas Analysis.	400.	500.	600.	700.	800.	900.	1000.	1100.
Hydrogen sulphide, Carbon dioxide.	19·45	10·25	6 80	4·70	4 50	3·65	3·95	3·25
Benzene, Ethylene hydrocarbons	35·85	16·90	19·45	17·40	16·60	14·00	12 75	19 50
Carbon monoxide	8·00	3 00	3·00	3·90	4·65	7·90	15·10	16 75
Hydrogen	10·25	20·45	22·70	24·00	26·25	30·90	37·40	39·50
Methane	2·20	4·00	7·25	14·35	18 00	22·80	18·00	10·45
Ethane	13·50	43·00	38·15	34·15	28·40	16·95	10·60	6·60
Nitrogen	10·75	2·30	2·65	1·50	1·60	3 80	2·20	3·95
Total volatile matter, per cent.	25·0	30·0	37·5	44·0	47·0	50·1	53·7	57·1
Tarry matter, per cent.	13·0	18·0	26·5	31·3	36·0	30·8	25·7	20·1
Volume of gas evolved, c.c. per gram at N.T.P.	11·8	37·7	70·8	96·6	137·4	160·6	193·7	254·1

These results are at variance with those given by Thornton and Smythe,* who distilled bitumen at certain (unrecorded) temperatures, and apparently obtained large volumes of methane, no ethane, and but little hydrogen. It may be remarked that a mixture of equal volumes of hydrogen and ethane gives the same results on explosion analysis as does pure methane. Hydrogen was directly determined by Thornton and Smythe in two samples only.

From the results given in the table above, the volumes of each constituent gas, hydrogen, methane, &c., evolved at each temperature, can be calculated. When these volumes are plotted against temperatures, curves are obtained which show the progressive increase with temperature in the quantity of hydrogen evolved, and show that this hydrogen arises, in part at all events, from the thermal decomposition of the paraffin hydrocarbons. The ethane curve (which includes the higher paraffins calculated as ethane) shows an abrupt declination after a temperature of about 800° C. has been attained; and the methane curve shows a similar, though more gradual, falling off after a temperature of about 900° C. has been reached.

* See "Journal," Vol. CXXIII., p. 555.

The Wellington Tube Works, Limited, of Great Bridge, Staffs., are issuing a circular notifying that Mr. William Jones (late of the Anchor Tube Company and Messrs. John Russell and Co., Limited, of Walsall) has accepted a seat at their Board, and will be representing them throughout the district.

LONDON COUNTY COUNCIL AND THE BRENTFORD GAS COMPANY'S BILL.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present the following reports of their proceedings on the Bill of the Brentford Gas Company of the present session.

The Brentford Gas Bill, 1914, contains powers to enable the Company to consolidate and convert their capital, to acquire the undertakings of the Staines and Egham District Gas Company and the Sunbury Gas Consumers' Company, to establish a sliding-scale of price and dividend, to apply for Provisional Orders for the supply of electrical energy, and to acquire by agreement electrical undertakings in or adjoining the Company's area of supply. That area includes the greater portion of the Metropolitan Borough of Hammersmith and small portions of the Metropolitan Boroughs of Fulham and Wandsworth. As the result of negotiations, the Administrative County of London has been excepted from the electricity provisions of the Bill, and an amendment has been agreed to to provide for separation of the accounts of the electricity and gas undertakings.

Clauses have also been inserted providing for the same standard of calorific power (540 B.Th.U., with a penalty if the calorific power of the gas falls below 499·5 B.Th.U.) as was imposed by Parliament on the Gas Light and Coke Company in connection with their Bill of this session. Provision has been made for penalties varying from £5 to £20 for deficiency of calorific power, which are those applying in the West Ham district of the Gas Light and Coke Company; and the promoters have agreed to provide and maintain the necessary apparatus for testing for illuminating power with a flat-flame burner for the purposes of information only, the penalties for deficiency being abolished. A clause has also been inserted instituting a test for sulphur impurities without penalties, and requiring the Company to provide and maintain apparatus for the purpose. The Council's petition against the Bill has been withdrawn.

EDINBURGH AND LEITH GAS ACCOUNTS.

There has been presented to the Finance and Law Committee by Mr. A. Canning Williams (the Treasurer and Collector to the Gas Commissioners) the draft accounts of the Edinburgh and Leith gas undertaking for the financial year ended May 15. Accompanying the accounts is the following report by him, which sets forth the main features of the twelve months' working.

General Statement.

The total revenue amounts to £358,031 17s. 2d., and the expenditure to £271,320 12s. 4d., leaving a balance of gross profit of £86,711 4s. 10d., which has been transferred to the credit of net revenue account. The charges against net revenue for annuities, mortgage interest, statutory contributions to the sinking and reserve funds, &c., amount to £110,788 10s. 7d., or £24,077 5s. 9d. in excess of the profit. This deficit (which is less by £361 5s. 6d. than the estimated one) has been made good out of the surplus revenue from previous years, reducing it from £30,578 7s. 1d. to £6501 1s. 4d. In 1912-13, there was a surplus of £8129 5s. 4d.; so that the shrinkage in profit compared with that year is £32,206 11s. 1d.

The following figures show how this result is reached :—

Decrease in income (revenue account)	£6,845 8 9
Increase in expenditure (revenue account)	24,437 3 6
Increase in charges against net revenue	923 18 10
Decrease of profit	£32,206 11 1

The falling-off in the profit is due to a heavy increase in the cost of coal, and a large decrease in the returns from coke and sulphate of ammonia.

Sale of Gas.

The quantity of gas sold is the record one of 2,019,241,700 cubic feet, which is greater by 56,459,700 cubic feet (or 2·88 per cent.) than the sale during the previous year. Increases took place in the summer and autumn and the spring terms, and a small decrease in the winter term :—

		Cubic Feet.	Per Cent.
Summer and autumn term	Increase of	37,925,500	5·12
Spring term	Do.	22,478,800	4·34
		60,404,300	—
Winter term	Decrease of	3,944,600	0·56
Increase for year		56,459,700	2 88

The following table gives further particulars of the sale of gas :—

—	1913-14.	1912-13.	Increase.	
			Quantity.	Per Cent.
	Cubic Feet.	Cubic Feet.	Cubic Feet.	
Ordinary consumers.	1,660,947,700	1,636,726,100	24,221,600	1·48
Engines, &c.	114,411,600	93,728,400	20,683,200	22 07
Prepayment consumers.	91,180,600	81,055,400	10,125,200	12·49
Stair lights	66,843,600	66,581,000	262,600	0·39
Public lamps	83,491,400	82,464,200	1,027,200	1·25
In bulk.	2,366,800	2,226,900	139,900	6 28
Totals	2,019,241,700	1,962,782,000	56,459,700	2·88

The value of the gas sold amounts to £262,119 18s. 3d.—an increase of £6110 6s. 8d. on 1912-13.

Residuals and Coal.

The revenue from residuals is £82,240 19s. 3d., as compared with £94,635 10s. 3d.; coke and sulphate of ammonia showing a reduction of £8569 14s. 10d. and £3838 11s 8d. respectively, and tar an increase of £13 15s. 6d.

The amount expended on coal (£131,394 0s. 7d.) is larger by £25,039 5s. 8d. than in the previous year. After making allowance for the additional quantity of coal used, the extra cost, due to higher prices, works out at over £23,000.

Summary of Year's Working.

The following figures summarize the year's working as compared with the previous year and the estimates :—

	1913-14.	1912-13.	Increase (+) or Decrease (−).	Estimates.
Income	£358,032	£364,877	− £6,845	£357,661
Expenditure	271,321	246,883	+ 24,438	271,980
Gross profit carried to net revenue account	£86,711	£117,994	−£31,283	£85,681
Charges against net revenue—				
Annuities	£29,966	£30,636	− £670	£30,250
Mortgage interest, &c.	35,040	36,108	− 1,068	34,300
Sinking funds	27,907	25,724	+ 2,183	27,720
Reserve funds	17,875	17,397	+ 478	17,850
	£110,788	£109,865	− £923	£110,120
Deficit for year	£24,077	..	..	£24,439
Surplus for year	..	£8,129	..	..

Capital Account.

The additions to capital expenditure amount to £6667 15s. 1d. (as compared with £12,801 6s. 11d.); £3537 8s. being for cookers and fires, £2094 18s. 9d. for mains, &c., and £1035 8s. 4d. for meters. Annuity stock and mortgages amounting to £57,681 14s. 10d. have been redeemed during the year, increasing the amount of extinguished debt from £348,456 11s. to £406,138 5s. 10d. The outstanding annuity and mortgage capital stands at £1,806,175 7s. 5d., compared with £1,860,777 17s. at May 15, 1913.

Redemption of Annuities.

Whereas at May 15, 1910, £2288 had been paid for redeemed annuities in excess of their capitalized value, this figure has been steadily reduced, until, at May 15, 1913, it was only £275. This £275 has been cleared off; and the amount paid in redemption of annuities as at May 15 last is less than their capitalized value by £2816 :—

—	Capitalized Value of Annuities Redeemed	Amount Charged to Sinking Fund for Redemption of Annuities.	Amount paid in Excess of Capitalized Value.	Capitalized Value in Excess of Amount Paid.
Totals at 15th May, 1910	£78,149	£80,437	£2288	..
Do. 1911	98,433	100,308	1875	..
Do. 1912	118,318	119,486	1168	..
Do. 1913	133,084	133,359	275	..
Do. 1914	172,138	169,322	..	£2816

BELFAST CORPORATION GAS UNDERTAKING.

Accompanying the accounts of the Belfast Corporation gas undertaking for the year ended March 31 last (which are signed by Mr. James D. Smith, the Engineer and Manager, and Mr. David Creighton, the Collector and Cashier), is the annual report of the Gas Committee, to which is appended the signature of the Chairman (Alderman James Craig). This states that the gross profit on the manufacture and sale of gas and residuals is £63,285; being a decrease of £20,531 compared with the year 1912-13. To this must be added interest received from the Belfast Banking Company, £1864, and the profit on the working of the Stoves Department, £440, making a total of £65,589. From this have to be deducted the dividends and interest on capital, £15,482, and the equivalent of interest on the redeemed stock, £4481—together, £19,963—leaving a net profit of £45,626, being a decrease of £21,005 on the amount this time last year. Adding the balance brought forward, £19,340, there is produced a total of £64,967. Out of this the following amounts have been set aside: Sinking fund, £8533; cost of twenty-eighth issue of stock, £3828; reserve for insurance of works, £1600; contingent renewal fund, £3000; parliamentary costs, £1765; arbitration costs, £1395—making a total of £20,121, and leaving a balance of £44,846. The Gas Committee have contributed for public purposes, to the Finance Committee, in aid of rates, £10,000, and in dividends and sinking fund on the New City Hall stock, £11,433; making together £21,433, and leaving a balance at the credit of the profit and loss account of £23,413.

Alderman James Craig (the Chairman of the Committee), referring at length to the results of the past year's working of the undertaking at the monthly meeting of the Council, said the year had been remarkable on account of the very high prices which they had to pay for coal and oil; the rates being even higher than in 1901, when the profits dropped to £22,968. Since that date, they had reduced the price of gas by giving 20 per cent. discount to all the consumers; wages had been increased by 10 per cent.; and coal, oil, and other materials had also risen considerably. Notwithstanding all these unfavourable circumstances, the profits this year were £63,285, which proved the great advance in the present methods of gas making, as compared with a few years ago. In the coal-gas section, there were carbonized 119,060 tons of coal, making 1478 million cubic feet of gas, at a cost of £107,909. The coal bill for 1913 was £93,685, which showed an increase of £14,224.

There had, however, been made considerable reductions in the cost of carbonization and purification. The water gas made was 1050 million cubic feet, which was 41 millions less than the previous year. The total cost for oil was £28,767, as compared with £15,595, showing an increased cost of £13,172, although they used 300,000 gallons less. However, there was a saving also in the cost of purification in this section. They had an increase in revenue from the sale of gas of almost £4000; about 33 million cubic feet more having been sold. The coke sold has increased by over 5000 tons; but owing to the reduction in price, there had been received £6000 less from customers. In the Stoves Department, they had had a very successful year; the profit realized being £440. The net increase in cookers, heaters, &c., was 1829. In the profit and loss account, after paying dividends, sinking fund, and cost of issue of stock, they had set aside to reserve for insurance £1600, to contingent renewal fund £3000, to cost of Belfast Corporation Act, 1912, £1765, and to cost of arbitration £1394. They had also contributed £10,000 to the general purposes fund in aid of rates, and £11,432 to pay dividends and sinking fund on the New City Hall stock. The Committee had agreed to recommend the Council to reduce the price of gas, as from Oct. 1 next, by 2d. per 1000 cubic feet for ordinary consumers and power purposes, and by 3½d. for prepayment consumers. This would make the prices in future as follows: Ordinary consumers, price reduced from 2s. 3d. to 2s. 1d., less 20 per cent. discount—equal to 1s. 8d. net. Power purposes, from 1s. 10d. to 1s. 8d., less 20 per cent. discount—equal to 1s. 4d. net. Prepayment consumers to be supplied with 40 feet for one penny, instead of 35 feet as formerly, or a reduction from 2s. 4½d. to 2s. 1d. per 1000 cubic feet. These reductions were warranted, owing to the reduced price of coal and oil; the entire benefit being given to the consumer. He was strongly of opinion that the profits of the gas undertaking should not be given in relief of rates, but that the consumers should first be considered, and the gas be supplied to them at the lowest possible figure. The present practice of giving the profits for the benefit of the ratepayers at large, many of whom did not use gas, was not fair to the undertaking, and should be discontinued. At the same time, he believed the Committee were quite willing to continue to pay the interest and sinking fund on the City Hall, amounting to over £11,000 a year, so that at some future time it could be handed over to the ratepayers free of debt. For the present financial year, however, the Committee had agreed to give £10,000 as usual for the relief of rates; and they would fulfil this promise. He thought the Council would agree that the Gas Department was being well managed, and that all, from the Manager to the workmen, deserved their best thanks for the very satisfactory results of the year's working.

Mr. SQUIRE seconded the motion.

Mr. RIDDELL thought the Chairman of the Committee should have given them a little more information in regard to the proposal to reduce the price of gas. The reduction would probably involve a sum of between £13,000 and £14,000 a year. He thoroughly approved of the reduction if it could be shown that it could be managed.

Alderman CRAIG said the reduction in the price of oil and coal was £16,000; and the decrease in the price of gas would amount to £16,900.

Mr. HENRY JOHNSTON was sure the consumers would be glad they were to get the benefit of the reduction in the price of oil and coal. He had always felt that consumers of gas and electricity should get them as near cost price as possible.

Mr. SQUIRE said Belfast now stood for the ordinary gas consumer the lowest but one (possibly two) in the United Kingdom and, with the exception of Huddersfield, they were giving more gas for a penny than any other place. He was very pleased that the reduction in price was to occur during the chairmanship of Alderman Craig, who had for many years taken a keen interest in the work of the Committee.

After Alderman Doran and Councillors M'Donnell and Irvine had joined in the congratulations extended to the Committee, the minutes were adopted.

Alderman CRAIG next moved—"That on and after the 1st of October next the price of gas to ordinary consumers be reduced from 2s. 3d. to 2s. 1d. per 1000 cubic feet, and gas for motive power from 1s. 10d. to 1s. 8d. per 1000 cubic feet, with the usual discount of 20 per cent.; and that 40 cubic feet of gas be supplied through auto meters for 1d. instead of 35 feet, as at present."

The motion was at once passed.

DUNDEE GAS-WORKS FINANCES.

In the course of his report upon the accounts of the Dundee Gas Commissioners for the year to April 30, Mr. T. H. B. Rorie (the Auditor) says that, in his opinion, the contributions to the Dundee Common Good from gas revenue and electricity revenue as such are illegal; while if treated as rent for the use of the Town House, they are unreasonable and excessive. There has been charged to gas capital account the sum of £2000 and to electricity capital account the sum of £1400 in respect of charges in connection with the Dundee Boundaries Act of last year. There does not appear to him to be anything in the Act authorizing any portion of these expenses to be charged against the Gas Commissioners; but, in his opinion, it is not otherwise unreasonable to do so. They should, however, be written-off from revenue within five years.

As to the accounts themselves (a copy of which has been forwarded by the Engineer, Mr. Alex. Yuill), these show that the total quantity of gas made was 1,031,627,000 cubic feet, of which 5,299,000 cubic feet was carburetted water gas. In manufacture there were employed 94,360 tons of coal and 16,134 gallons of gas oil; the make of gas per ton of coal carbonized being 10,876 cubic feet. The make of coke was 12·08 cwt. per ton of coal, exclusive of that used for firing the retorts. There were produced 9·71 gallons of coal tar per ton, and 27·47 lbs. of sulphate of ammonia were made. The coal cost 15s. 9¾d. per ton; and the coal carbonizing charges amounted to 1·04d. per 1000 cubic feet. The cost of production of the carburetted water gas was 1s. 3·38d. per 1000 cubic feet; and the average cost per 1000 cubic feet for both coal gas and carburetted water gas was 1s. 6·49d. per 1000 cubic feet. The capital per million cubic feet of gas delivered amounts to £381; while the price of gas in Dundee (subject to a discount of 5 per cent.) is 2s. 2d. per 1000 cubic feet. The income for the twelve months was £146,719, and the expenditure £125,088. After meeting interest and sinking fund charges, &c., a deficiency of £6338 was shown. At the end of the year there were 48,531 consumers in Dundee, and 3148 in Broughty Ferry.

STOCKPORT CORPORATION GAS UNDERTAKING.

The New Carbonizing Plant.

At a Meeting of the Stockport Town Council last Thursday, Mr. A. E. Ferns, J.P., in referring to an account for the expenses of the Gas Sub-Committeee in connection with their visit to Germany in regard to the question of new carbonizing plant, said he was not aware that they had yet had a report from the Sub-Committee, and it was rather putting the cart before the horse to ask the Council to pass the expenses of the deputation before they had received a report on the matter upon which the deputation went abroad. He thought they ought to have the report as soon as possible, because if the Munich system was considered satisfactory, and they decided to adopt it, there would be no necessity to go to the expense of inspecting other plants. He also wished to ask who was the interpreter who accompanied the deputation in Germany. Was he the agent for the plant of the Munich system, which they were contemplating purchasing?

The Chairman of the Gas Committee (Mr. J. Winter, J.P.) said that, as the expenditure in installing a plant would amount to between £30,000 and £40,000, he thought the Council should have the fullest information before them, and proceed with caution. The installation of the plant would not only be remunerative from the monetary point of view, but would enable the workmen to fulfil their duties in the retort-house under more comfortable and healthy conditions. With regard to the interpreter, he did not think he was agent for the Munich chamber system, but for some part of the material. The gentleman in question enabled them to get over the ground quickly and see all they wanted to see. It was necessary to have someone to explain to them the various details of the plant. Some 80 per cent. of the Munich chamber plant would be made in England. It was chiefly the brick-work used for the ovens that would come from Munich.

BLACKBURN GAS STRIKE SEQUEL.

Allegations of Victimization.

There was a sequel to the Blackburn gas-workers' strike at a meeting of the Town Council last Thursday, when Mr. E. Porter, the local representative of the National Union of Gas-Workers and General Labourers, and a Labour member of the Town Council, moved that, in view of the fact that the Gas-Workers' Union disagreed with the interpretation placed by the Council on the terms of settlement, they should accept the suggestion of Mr. J. R. Clynes, M.P., in a letter to the Mayor, for the appointment of an impartial person to hear evidence and decide upon the disputed points—both parties to abide by his decision.

Mr. Porter said that the Union was of opinion that the Corporation had failed to carry out the agreement. The men were led to understand that, with a few exceptions, all the strikers would be reinstated; and there was a clear understanding that no man would be kept on who had been engaged to supplant the regular employees. There were instances so obvious in character that the men believed they had not obtained their old positions simply because of the part they had played in the strike. In some instances these servants had been in the employ of the Corporation without complaint for upwards of twenty-five years; and the Union was inclined to the view that the men were now being punished for the action they had taken.

After some talk by Labour Members of the Corporation,

Alderman Nuttall, the leader of the Council, claimed that the Corporation had fulfilled the terms of the agreement to the strict letter.

The resolution was defeated.

CRITICAL COUNCILLORS AT OLDBURY.

The position of the Oldbury gas undertaking was gone into last week at a special meeting of the Council presided over by Mr. J. W. D. Pratt. It was explained that the meeting had been convened through a resolution moved by Mr. Wortley, who, with Mr. H. H. Robbins, had raised certain matters of importance to the gas concern, and had also publicly complained of the present position of affairs in connection with the works.

There were five complaints raised by Messrs. Robbins and Wortley. In the first place, Mr. Robbins alluded to the foundations of the new gasholder, which he argued had cost far too much. It was, he believed, possible to have found a cheaper and better site. Mr. Wortley strongly supported the view that the Committee ought to have found another site for the holder. The cost of the foundations alone was £4187. Mr. Robbins complained that the Committee had been spending money on the repair and renewal of purifier grids when the cost should have fallen on the makers. He also strongly urged that the coal used should be submitted to careful tests, and that the present method of testing the quality of the gas was anything but satisfactory. Then he considered that some one ought to be responsible for the outside workers in the employ of the department.

In the absence of the Manager (Mr. A. Cooke), who was still too ill to attend the meeting, Mr. Tomlinson (the Chairman of the Committee) dealt with the complaints. With regard to the foundation of the gasholder, he said it was known to the Committee that the only site was

of a doubtful nature; and for this reason the contract provided for the work to be paid for on a schedule according to the amount of excavation and concrete required. It was absolutely necessary to get down to virgin soil, and this was at considerable depth. The concrete buttress wall now being erected round a portion of the holder tank was part of the original scheme, and provided an additional support for the external thrust in the tank on that side where, owing to the differences in the levels, it was not feasible to fill the ground to the level of the top of the wall, which protected about 10 ft. 8 in. of the tank. Specifications were prepared and approved by the Committee before the purifiers and grids were ordered. The fact that the Committee had now decided to renew the bottom layer of grids and provide additional bearing bars did not in any way reflect on the makers or any one else in connection with the supply of the purifiers. As to the tests of coal, before contracts were placed sample 30-ton lots were tested for gas-producing quality, coke, &c.; and the gas yield per ton was recorded. These practical tests were much better than laboratory ones. The gas was tested each day for purity in its passage through the purifiers. Then it was kept up to the parliamentary standard by readings of a jet photometer, which, in his experience, were exceedingly reliable, and might be depended on to be within half-a-candle of the bar photometer. In view of the size of the undertaking, it had not been considered necessary to appoint anyone solely for the supervision of the fitters, &c.; and, so far as could be judged, only straightforward and honest men were employed. Large outside contracts or special jobs had always been visited and supervised by the Manager or his Assistant.

Ultimately, the majority of the Council expressed themselves satisfied with the Chairman's explanation; and the discussion ended without any decision being arrived at.

TIPTON GAS-WORKS RESULTS.

At a meeting of the Tipton District Council last Tuesday, the Gas Manager (Mr. S. O. Stephenson) reported that the undertaking had had a very successful year; and he congratulated the Committee upon a satisfactory balance-sheet. He was pleased to say there was a large increase in the consumption of gas; and considering the high price of coal and the slump in residuals, the profit was better than he had anticipated. The extensions of the works were now completed; and he was looking forward, with economical working of the concern, to a very prosperous period. He mentioned that they were this time contributing £600 out of profits in relief of the rates.

A recommendation was made by the Gas Committee that the cost of a new boiler and coke-screen, and also the excess of expenditure on extensions, amounting to about £1000, be paid out of revenue. Mr. Powell opposed this, and urged that it would be putting an unfair burden on the present generation; whereas if they borrowed the money, the gas consumers and the ratepayers would benefit. The capital of the undertaking was, he said, at present only £57,300; but the works output was three times as much as when the capital was £60,000. This fact alone should convince them of the importance of borrowing the money. Mr. Baker pointed out that the maintenance of the gas-works had not so far cost the ratepayers a penny. He was optimistic enough to believe that next year they would be able, not only to pay the £1000 referred to out of revenue, but also to contribute £1200 in relief of the rates. The Chairman (Mr. T. Salter) said by borrowing money they would only increase their interest charges, which he did not think would be wise to do.

Ultimately, an amendment to refer the matter back to the Committee was defeated, and the recommendation was approved.

CHEAPER GAS FOR DROITWICH.

The Report of the Engineer.

The Droitwich Town Council have decided to make the following reductions in the price of gas: To consumers per ordinary meters, 1d. per 1000 cubic feet, making the price 2s. 4d. and 2s. 8d. net. To prepayment consumers, 2d. per 1000 cubic feet; and for the public lighting, 2s. 6d. per lamp per annum. The price of gas has been reduced no less than 8d. per 1000 cubic feet in the last five years.

In the course of his report to the Lighting Committee on the working for the year ended March 31, the Engineer (Mr. F. Shewring) states that, while the gas manufactured increased by 902,600 cubic feet, or 3·7 per cent., the quantity sold was more by 993,800 cubic feet, or 4·7 per cent. As a matter of fact, since 1908 [the present one is Mr. Shewring's seventh annual report] the gas sales have increased 43 per cent. In the past twelve months the yield of gas per ton of coal carbonized was 11,030 cubic feet; the amount sold and accounted for per ton being 10,612 cubic feet, against 10,522 cubic feet—an advance of 90 cubic feet on the previous year's record figure. The figure for unaccounted-for gas (3·7 per cent., against 4·6 per cent.) is the lowest in the history of the undertaking. The year's working shows a gross profit, after allowing for depreciation, of £1297. This is only £100 less than the previous year, in spite of increases in the price of coal, labour, and taxation, and a reduction in the price of gas last year. Residuals realized more; the profit on sulphate of ammonia being the highest on record—£61 more than for the preceding twelve months, notwithstanding that the average price obtained per ton was less. Capital expenditure in the way of additions to plant was incurred to the extent of £1520; and the whole of this was paid for out of revenue. This, with interest and sinking fund payments, changed the gross profit of £1297 into a debit balance of £720.

As an expression of the esteem of the Directors of Messrs. John Wright and Co., of Birmingham, on the occasion of his retiring from the post of Northern Sales' Manager to the Company, Mr. David Morris has been presented by Mr. H. James Yates, the Chairman of the firm, with a silver tea and coffee service, bearing a suitable inscription.

SUCTION GAS v. TOWN GAS FOR ENGINES.

The Drainage Committee of the Fleet Urban District Council recently had before them a report by their Consulting Engineer (Mr. Moss Flower) with regard to the question of using suction gas or town gas for driving the engines to be provided in connection with their sewerage scheme. He remarked that before submitting his scheme (which included the use of engines operated by town gas), he had carefully considered the question of motive power. When it was possible to obtain town gas at the price charged at Fleet—2s. 8d. per 1000 cubic feet, less 10 per cent. discount—he could see no advantage in using suction gas. On the contrary, town gas was most desirable from several points of view. The power of the engine to be supplied at Fleet would be 30 B.H.P. working continuously, and a maximum of 34 B.H.P., on town gas. If suction gas were used, the same engine would only give 25 B.H.P. working continuously, and a maximum of 27 B.H.P. So that in order to obtain 30 to 34 B.H.P. with suction gas, it would be necessary to instal a larger engine at considerable extra cost. There would also be the cost of the suction-gas plant, the building in which to house it, and other incidental expenses. It was claimed by some that suction-gas plant did not require skilled labour; but with this he did not at all agree. It needed more or less constant attention; and one had to depend a great deal on the human element. Dirty valves, too, often gave a great deal of trouble. With town gas the engine could, in any emergency, be started at a moment's notice. With suction gas, it would be absolutely necessary to instal a town gas supply; and the cost of laying mains, providing a meter, &c., would in any event have to be incurred, The amount of labour at the air-compressing station would be much greater if suction-gas plant were installed.

Mr. Elmes said he thought the Engineer had made out a very good case for town gas. The Chairman (Mr. W. T. Prideaux, J.P.) said he had heard that at Farnborough suction gas was installed, but was found to be impracticable, and had to be replaced by town gas. He would like to verify this. Mr. Edwards proposed that the Council should arrange for the use of town gas; and this was agreed to.

Fleet is one of the out-districts of the Aldershot Gas, Water, and District Lighting Company; and the price of gas there for engines is, as stated, 2s. 8d. per 1000 cubic feet. But in the Company's home area the charge is 2s.—in both cases less discounts, graded according to consumption.

SULPHATE OF AMMONIA COMBINATIONS IN GERMANY.

In the last number of the "JOURNAL" (p. 1059) we gave some figures from the report for the year 1913-14 of the German Residuals Society. They may be usefully supplemented by the following particulars bearing upon sulphate of ammonia combinations in Germany, which appeared in the "Iron and Coal Trades Review" for the 3rd inst.

The production of sulphate of ammonia in Germany now amounts to about 500,000 tons per annum, of which 400,000 tons apply to the districts to the west of the River Elbe, and the balance to the east of that country, inclusive of the Austrian output, most of which has to be exported to Germany owing to the inadequacy of the native consumption. At present it is impossible to undertake the export of ammonia to Russia, notwithstanding that the import duty is lower than formerly. It is understood, however, in connection with the negotiations for the conclusion of new treaties of commerce, that Russia proposes to suspend the import duty so that sulphate of ammonia may be rendered available to the agriculturists as a fertilizer.

The preponderating portion of the 400,000 tons produced in the west is under the control of the Ammonia Sales Association of Bochum; while most of the remaining 100,000 tons in the east is in the hands of the Upper Silesian Coke-Works Company. A complete understanding exists between the Association and the Upper Silesian Company, without, however, the latter becoming directly connected with the former; the agreement providing for the mutual limitation of markets for the disposal of the output. The arrangement was recently threatened by the production by the Badische Aniline and Soda Works Company of artificial ammonia by the Haber process; but this Company has now also come to an understanding with the Association in regard to a restriction of the market for its output. As a consequence, there are now three groups in friendly relations. But the question as to how long this connection will continue depends upon the circumstance as to whether the Association can be prolonged on the lapse of the existing agreement at the end of 1915; and this in turn will be dependent on the renewal of the Westphalian Coal Syndicate by the close of 1915.

The co-operation of producers has had the effect of bringing the price to about £12 to £12 10s. per ton in Germany and Austria; whereas the quotation in England is only about £10 13s. It is now proposed to convert the organization in the east of Germany into a definite syndicate under the heading of the Upper Silesian Coke-Works Company; all the interested parties having already agreed to the proposal in principle.

MANCHESTER CORPORATION WATER SUPPLY.

Safety of Longdendale Reservoir Embankments.

At the Meeting of the Manchester Corporation last Wednesday, the question of the safety of the embankments of the Longdendale reservoirs was raised on the presentation of the minutes of the Water Committee. The Council had had before them reports on the subject by Messrs. G. H. Hill and Sons, and by Mr. Joseph Parry, of Liverpool.

Alderman HOLT (the Chairman of the Committee), in moving the adoption of the minutes, said that at the last meeting he had promised the Council that he would furnish them with the independent report of the Engineer to the Liverpool Corporation (Mr. J. Parry) and it had

been supplied to each member, after being considered at a special meeting of the Committee. He thought the report completely exonerated and supported the position which had been taken up by the Water Committee. This position had been that, so long as the water-level was kept 5 or 6 feet below the overflow weir, there was no possibility of any danger. If the reservoir were to be completely filled, then the necessity would arise for the construction of extensive overflow works. With regard to the recommendation of Mr. Parry, that the *débris* at the back of the Heyden and Etherow weirs should be removed to a site above top-water level, and that the sluices should be repaired, Alderman Holt said there must have been some reason for allowing the *débris* to accumulate, but this he would inquire into. He promised that the Committee would carry out other recommendations—that works should be executed to make good any deficiency in the discharging capacity of the flood-water courses; that self-recording rain gauges should be placed in suitable positions; and that automatic level recorders should be fixed in the Woodhead and Torside reservoirs, and at the overflow weir on the River Etherow. In conclusion, Alderman Holt said the reservoirs of the Corporation were not unsafe. If he or any member of the Committee thought for a moment that there was any doubt as to their safety, they would never sanction the withholding of the necessary work. But not a drop of water had gone over the weirs for close upon thirty years.

Sir ALEXANDER PORTER said that though Alderman Holt had stated that there was no doubt in the minds of the Committee that the Longdendale works were absolutely safe, their own official experts said, definitely and distinctly, that they were incurring a very considerable danger; and they drew illustrations from other water-works where great catastrophes had occurred. The Council surely could not ignore a position of this sort; and for the Water Committee to take an opinion such as Mr. Parry's, deal with it in half-an-hour, and throw overboard all their own expert officials' advice, seemed to him anything but a businesslike proposition. If the Water Committee or the public did not realize the responsibility that lay upon them, the people who lived in the Longdendale Valley, whose lives and property were in danger, would realize it. He begged, therefore, to move, as an amendment, that the minutes of the Committee upon this point be referred back.

Mr. MACLACHLAN seconded the amendment.

Mr. KAY said that during the last thirty years no water had overflowed; and unless there were certain physical alterations in the neighbourhood it would never overflow again. There was no necessity at all for the work at the moment.

After some further remarks,

Alderman HOLT replied. He asked the Council to have confidence in the Committee, and believe that everything was being done in connection with the water-works that was absolutely necessary, and that there was no danger whatever.

On the amendment being put, it was lost by 80 votes to 21; and the minutes were approved.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At the meeting of the Edinburgh and Leith Corporations' Gas Commissioners, the Convener of the Works Committee reported that the purchase of 211,000 tons of coal had been made, at an average price of 12s. 4¾d. per ton, or practically 1s. 6d. per ton less than that paid last year. The abstract of the annual accounts to May 28 last was remitted to the Finance Committee for final revision. The Convener regretted that they, in common with other large concerns throughout the country, had this year to face a considerable deficit on the working. This deficit, however, was not due to any check in the development or in the forward march of the undertaking. On the contrary, the figures spoke of progress all along the line. The gas consumed or sold during the year created a record, which in money value represented £6000 more than the figure for 1912-13, which, in its turn, had shown an abnormal advance on preceding years. The fact that substantial progress had to be recorded with a practically stationary population and with electricity forging steadily ahead, pointed to considerable enterprise on the part of those conducting the undertaking. The deficit was anticipated when the estimates were framed; and to show the accuracy of the prediction, the difference was only £362 less than the amount of £24,439 anticipated. The whole deficit was accounted for by the increased cost of coal during the year. The prices, however, that had been realized for coke and sulphate of ammonia were less than those for the previous year, and though less than last year, the figures were £10,100 up on those of the preceding two years, and in advance of any year in the history of the undertaking. The total revenue amounts to £358,031, and the expenditure to £271,320; leaving a balance of £86,711, which is not sufficient to meet the charges for annuities and interest.

In a recent minute to the Commissioners, Mr. Masterton gave a very interesting table showing the comparative minimum rates paid to labourers in the various public departments of the city, the number of hours worked per week, holidays, sickness and other allowances, and superannuation arrangements. It was also intimated that the Corporation of Edinburgh had accepted the Commissioners' terms for public lighting for next year. Mr. Canning Williams reported to the Finance and Law Committee that the total sale of gas for the year 1913-14 was 2,019,241,700 cubic feet, or 2·88 per cent. more than in 1912-13. This increase is largely due to the use of gas in engines, which accounts for 22 per cent. of the total increase; while prepayment consumers have used about 12½ per cent., and sales in bulk have been 6¼ per cent. more. The coke and sulphate of ammonia show a reduction of £8569 and £3838 respectively; while tar shows an increase of £13. Coal prices are up £25,039.

Another place where a loss has occurred is Kirkcaldy, where a deficit of £400 is shown upon the year's working. This was also not entirely

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unanticipated. The Gas Committee have recommended that 1d. should be put upon the price of gas, making it 3s. 4d. per 1000 cubic feet for the ensuing year. This, with the lower price of coal, which represents 1½d. per 1000 cubic feet, should well cover the deficit, and put the accounts on the right side.

It will be remembered that the Dysart Town Council have for some time had before them the question of the purchase of the Gas Company's undertaking. After a careful consideration of this proposal to municipalize the gas-works, it was decided, by five votes to two, not to continue with the negotiations. It is curious, with so many councils desiring to acquire the gas undertakings in their burghs, to find one which thinks matters can go on without being directly under their control.

The report and balance-sheet of the Galston Gas Company, Limited, for the year to May 30 last, which have been presented to the shareholders, were very favourable—allowing for the declaration of a dividend of 6 per cent. on the ordinary share capital.

The Kilmarnock Electric Extension Bill is to go forward as an unopposed measure; the County Council of Ayr having withdrawn their opposition. This Bill gives power to the Kilmarnock Corporation to supply electricity to a number of towns round and about it; and it will behove the gas suppliers in these places to keep the advantages of gas before their customers, so that as few as possible will be induced to introduce the other illuminant.

Considerable discussion arising out of the increase of pay granted to the workmen at the gas-works took place at the Dumfries Town Council meeting. The amount, according to the Provost, who said he had something to do with the matter and must stand the brunt of it, was about 2s. or more in some cases. The higher-paid men who worked the machinery had not got an increase, because they were already in receipt of good wages; but the other workers who had not such good pay had been given the increase. The cashier, the clerk, and the collector had sent in a joint letter asking for an advance in their salaries, and a report upon the whole salaries and duties of the gas manager, gas foreman, and clerical staff was ordered to be prepared and submitted to a future meeting of the Gas Committee. It was reported in a local paper that: "The past financial year of the gas-works has been a remarkably prosperous one. The consumption has greatly increased; the loss by leakage has been reduced as nearly to vanishing-point as it seems possible to attain; and the profit on the year's working, instead of the £200 or £300 that was budgeted for, is likely to exceed £2000." The books are, it might be remarked, still under audit, so that the final figures are not yet available.

Brentford Gas Bill.—The General Purposes Committee of the Wandsworth Borough Council have reported that clauses have been inserted in the Brentford Gas Bill to meet the objections made by the Council, and that their petition against the Bill has therefore been withdrawn.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 6.

Since the last report there has been an improvement in pitch, and the position can be looked upon as firmer, although makers still call the price 36s. 6d. per ton net at works. Creosote continues firm at 3⅝d. to 4d. per gallon net and naked; also pyridine, at 8s. 6d. to 8s. 7½d. per gallon net, filled into buyers' packages. Other prices are: Solvent naphtha, 90-160, 10⅜d. per gallon; benzol, 1s. 2d. per gallon; 90 per cent. toluol, 11d. per gallon, all net and naked; 40-50 per cent. anthracene, 2d. per unit, packages free; 60's crude carbolic acid, 1s. 1½d. to 1s. 2d. per gallon net, casks included.

The tone of the sulphate of ammonia market is decidedly better. There has been a large inquiry during the past week, and £10 10s. per ton net, into buyers' bags, has been freely bid for 25 per cent. quality for July-September delivery.

Tar and Tar Products in the Provinces.

July 4.

The average values during the week were: Tar, 24s. 3d. to 28s. 3d. Pitch, east coast, 32s. to 32s. 6d.; west coast, Manchester, 30s. 6d. to 31s. 6d.; Liverpool, 31s. 6d. to 32s. 6d.; Clyde, 31s. 6d. to 32s. 6d. Benzol, 90 per cent., naked, North, 8½d. to 9d.; 50-90 per cent., naked, North, 10d. to 10½d. Toluol, naked, North, 10½d. to 11d. Crude naphtha, in bulk, North, 4½d. to 4¾d. Solvent naphtha, naked, North, 9½d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9½d. f.o.b. Creosote, in bulk, North, 3¼d. to 3⅜d. Heavy oils, in bulk, 3⅜d. to 4⅛d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 1d. to 1s. 2d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1⅛d. to 1⅜d.; "B" quality, nominally, ¾d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *July* 3.

Throughout the week the market for this article has continued strong, and in order to secure their requirements buyers have found it necessary to pay steadily advancing prices. The nearest values at the close are £10 15s. per ton f.o.b. Hull, £10 16s. 3d. per ton f.o.b. Liverpool, and £10 17s. 6d. per ton f.o.b. Leith. There has also been a good demand for future shipment, and it has transpired that £11 per ton has been realized for delivery in equal monthly quantities up to the end of the year, and £11 2s. 6d. per ton for January-June next year, f.o.b. good port.

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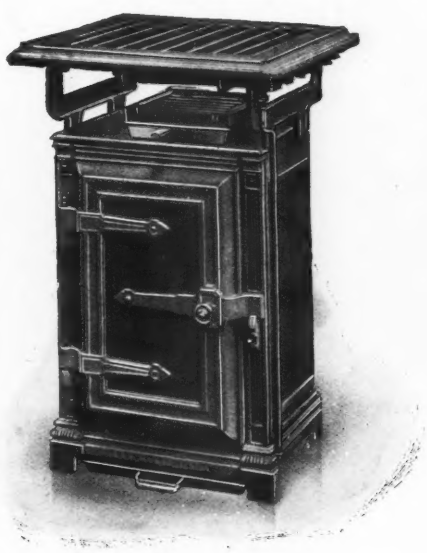

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tions remain 9s. 10½d. per cwt. for ordinary quality, and 10s. 1½d. for refined, on spot.

From another source it is reported that the market for sulphate of ammonia is steady, which is not unexpected after the big fall which has taken place. Outside London, makes are quoted at £10 to £10 2s. 6d.; Leith, £10 10s. to £10 12s. 6d.; Hull, £10 10s.; Liverpool, £10 10s.; Middlesbrough, £10 10s.

COAL TRADE REPORT.

Northern Coal Trade.

The Northern coal trade is firmer, with a strong demand and prices well maintained. In steam coals, best Northumbrians are in rather pressing need, and are quoted from about 14s. 6d. per ton f.o.b., though one or two sales are reported at slightly higher prices. Second-class steams are a little higher at 12s. 4d. to 12s. 6d. per ton; and steam smalls are 8s. 3d. to 9s. 3d., according to quality. Some large contracts for coals for Russia are in the market. In the gas coal trade, deliveries on contract are a little heavier, and the exports are full at present. Best Durham gas coals are steady at 13s. per ton f.o.b. The output is kept down by local holidays, so that the moderate consumption takes up the production. Second-class gas coals are about 12s. per ton f.o.b., and "Wear specials" are unaltered at 13s. 6d. to 13s. 9d. per ton. There are still a few small contracts for gas coals in course of negotiation. Buyers and sellers, however, differ in opinion as to the prices that will rule forward, and thus there is only a slow settlement at prices near those that have ruled in the large contracts reported before the end of the half year. Where delivery is long forward, prices are a little easier. Coke is steady. Gas coke is in fair demand, the exports from the Tyne having been heavier of late. Good gas coke is about 13s. to 13s. 3d. per ton f.o.b. in the Tyne.

Accrington Gas and Water Board.—The annual report of the Board shows that for the year ended March 31, the coal carbonized was 43,078 tons—an increase over the previous year of 962 tons. The gas made amounted to 457,718,000 cubic feet, or an increase of 6,472,000 feet. The net cost of coal carbonized was 16s. 8½d. per ton, against 14s. 10½d. the previous year. The gross profits on the combined undertakings were £41,299. After all demands had been met, there was a surplus of £2786. The surplus revenue of the gas department now amounts to £17,528. Gas consumers number 20,867—an increase of 326. The Auditor's report says that the revenue of the water undertaking has increased by £1816; while that of the gas-works has decreased to the extent of £4077, due to the increase in the price of coal, &c.

Warrington Gas-Works Results.

Mr. W. S. Haddock, the General Manager of the Warrington Corporation Gas Department, in his annual report to the Gas Committee, states that the net profit has fallen to £8619, or £5829 less than last year, due to increased cost of coal, lower prices for residuals, and higher cost of repairs. He adds that coal cost over £5500 more, as an extra 3400 tons were used and the average price was higher. Wages for carbonizing were £500 more, due to working extra coal and the wages being slightly higher. The repairs on plant were £3691 more, owing to renewing the coal-handling and other plant. The lamps had cost £313 less, as the repairs were much lower and wages over £50 less. Lamp lighting was less, as there had been a saving of over £150 on controllers, though an increase of £60 in wages. Rates were lower, as the income-tax charges were on a reduced profit. The small charge of 2s. for fixing slot-ranges had had the desired effect of keeping consumers who did not use ranges from applying for them; the saving being nearly £700. There had been increased revenues of over £3000 on gas, due to larger output, and of £234 in miscellaneous sales. Although more bye-products had been made, there was a decreased income of over £1100, due to the fall in prices. The increased make of gas was 34,247,000 cubic feet, equal to 6·6 per cent. upon the previous year's production.

Neath Gas Affairs.—Consequent on the appointment of a financial officer in connection with the Neath Corporation Gas-Works, there was a feeling among certain members that the salary of the Manager should be reduced; and a suggestion to this effect has been referred to the Gas Committee. Mr. David Jones (the Gas Collector) has been re-instated in his position, by nine votes to six. Alderman Hopkin Morgan (the Chairman of the Gas Committee) said the balance-sheet for the year showed a profit on the works of £5035. Each year nearly £5000 was paid in interest and sinking fund charges; and the undertaking did not cost the ratepayers a single penny. He was convinced that the works would ere long become a valuable asset to the town.

East Surrey Water Company.—The report of the Directors of this Company for the year ended March 25 last called attention to the fact that this was the fiftieth that had been issued to the shareholders; and that in spite of the struggles and vicissitudes which the Company experienced during the early stages of its career, and notwithstanding the reductions in water-rates and charges imposed by the recent Provisional Order, the Company's position generally is very satisfactory. The profit for the year was £27,018, which, with the balance of £9778 brought forward from last year, made a sum of £36,796, out of which the Directors placed £1250 to the renewal and contingency fund, and recommended a dividend of 5 per cent. on the preference shares, 7 per cent, on the ordinary "B" shares, and 10 per cent. on the original ordinary "A" shares. This would leave a balance of £9840 to be carried forward.

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Bradford Gas-Works Statement.

At a meeting of the Gas Committee of the Bradford Corporation on Friday week, the annual financial statement was presented by the City Treasurer (Mr. F. Ogden Whiteley). According to the figures, the income from gas amounted to £196,000, this being £1800 less than last year. The difference is accounted for in large measure by the reduction in the price of gas supplied for power purposes to 1s. 6d. per 1000 cubic feet. The sale of coke and other residual products realized £10,800 less than in the previous year; the cost of coal and wages, materials, repairs, and maintenance increased by £5600; while the gross profit was £57,000, as against £79,000. Upon the year's working there was a loss of £865; and as there was a profit of £19,745 on the preceding year, there was a difference of over £20,600. The causes of the loss were stated to be the decrease of the income and the increased cost of production. The market price for residuals during the year was very low; but the prices for coal and other materials had meanwhile been maintained at high rates. Interest and sinking fund charges amounted to £58,000, as against £59,000.

Bethnal Green Guardians and Inverted Lighting.

The Waterloo House Committee of the Bethnal Green Guardians have been considering the question of the lighting of the Institution, and in connection therewith have had submitted to them a scheme drawn up by the Gas Light and Coke Company, to alter the existing burners into the inverted incandescent type. It is claimed for the scheme that it will reduce the consumption of gas, and will provide an improved light and a better distribution of the burners throughout the building than at present, though they will be reduced in number. After considering the offer, the Committee are of opinion that the Board, by its adoption, would save at least £30 per annum for the first five years, and after that at least £90 per annum, in addition to the present annual cost of replacing burners, globes, chimneys, and mantles. They accordingly recommend that, subject to the sanction of the Local Government Board, a contract be entered into with the Company, for carrying out the new installation and for its annual maintenance. The following are the details of the scheme: (1) To instal throughout the building inverted incandescent burners, at a cost of £295. This would be spread over a period of five years, at £59 per annum. (2) To enter into a contract for the maintenance of the burners, at an annual cost of £59. This represents 789 burners at 1s. 6d. per annum each. The maintenance includes: (*a*) Cleaning and regulating burners; (*b*) supplying new mantles of thoroughly tested and approved quality and replacing any small parts of burners, such as bye passes tips, gauzes, &c., when rendered necessary by ordinary fair usage; (*c*) cleaning chimneys and replacing any broken in ordinary fair usage; (*d*) and cleaning and renewing the globes if broken in fair usage. The Company's fitters will call weekly to carry out this work.

Slaithwaite and Longwood Gas Amalgamation.

In connection with the opposition of the Golcar District Council to the amalgamation of the Slaithwaite and Longwood Gas Companies, owing to the terms of reduction in the price of gas mentioned in the Companies' Bill in Parliament, a meeting of the Golcar Council was held last Thursday, when it was stated that there was now no need for any further opposition. The original measure provided for a reduction of the price of 1d. per 1000 cubic feet per year for five years from 1916; but owing to the Council's opposition, Parliament had reduced the price by 1½d. per year for three years, and ½d. in the final year. Now, as a result of a meeting between a deputation from the Council and the Directors of the Companies, it had been agreed that the price of gas in Slaithwaite should be reduced 2d. per 1000 cubic feet in the first year, 2d. in the second year, and 1d. in the third year, so as to bring a flat-rate into operation by Jan. 1, 1919. The deputation had also secured a concession in regard to burners; and the Council decided that, upon receipt of a letter of confirmation from the Directors, the Clerk should be instructed to thank the Linthwaite and Slaithwaite Councils for agreeing to meet them in conference, but should point out that any conference was not now necessary. The Clerk was also nstruct ed to thank the Directors of the Companies for the manner in iwhich they had met the deputation.

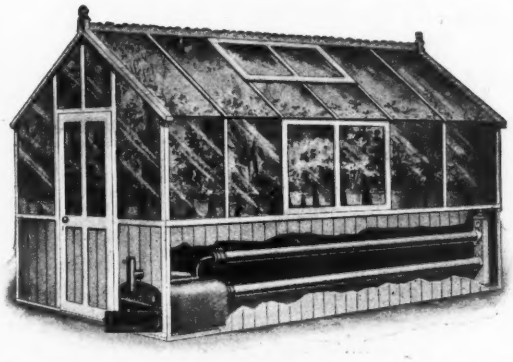
Gas Supply at Bailiffe Bridge.

An interesting situation is stated by the "Yorkshire Observer" to have arisen in connection with the public gas supply of the village of Bailiffe Bridge. The statement of our contemporary is as follows: The statutory powers are possessed by Bradford and Halifax, but neither has exercised them, because of distance and the low level. For more than thirty years the district has been supplied by the Brighouse Corporation, who, three years ago, entered into a new agreement with the full consent of the Bradford and Halifax authorities, and in connection with a Provisional Order which was obtained by Hipperholme. It is stated that in connection with the negotiations at that time both Halifax and Bradford disclaimed any intention of ever exercising the powers they possessed. This week, however, to the surprise of the Brighouse Corporation, notice was received intimating the termination of the agreement; and on Wednesday evening, in committee, the Halifax Corporation approved an agreement to give a supply to the whole of Hipperholme, including Bailiffe Bridge, instead of only two-thirds of the district as hitherto. Considerable reductions have been made in the bulk-supply price, which will enable the Hipperholme Council to make one flat-rate charge of a much lower character throughout the whole of their area than has been possible up to the present. The agreement, and the adoption of the high-pressure system, is being received with great satisfaction at Hipperholme. At Brighouse, however, much indignation is being expressed; and at a specially called informal meeting of the Council, the Town Clerk was instructed to take all possible steps to protect the interests of the borough."

Greenhouse and Garage Heating.

Everywhere the public is being infused with the "Do it now" spirit, earlier holidays, earlier shopping, &c. Why not ask Consumers of Gas to make early provision for heating their Greenhouse and Garage, and give you more time for other urgent orders?

Encourage consumers in your district to instal Richmond's "DAISY" Boiler. Our "Plant Life" literature is ready for distribution.



Richmond's "Daisy" Boiler fixed showing Flue and Swing Lighting Door outside, and Circulating Pipes and Expansion Box inside the house.

"The 'Daisy' Boiler continues to give me "entire satisfaction. I can recommend "it for its heating capacity, reliability, "convenience, and low cost of upkeep."

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Maryport Gas Scheme.

The Maryport Urban District Council have made a start with the task of laying the gas-mains to Flimby, a mining village 1½ miles away, the Parish Council of which have agreed to purchase gas for the lighting of the village from the Maryport Council, who will also sell to private consumers at the same rate as they charge the Maryport householders. The complete scheme, including the laying of the mains and the provision of fittings, &c., is estimated to cost £4000. The work will be done by the Council direct, without the intervention of a contractor, although the Council recognize that the letting of the work by contract would be, for themselves and their officials, the simplest and easiest system. In view of the number of unemployed men in the town, they decided to undertake the work themselves, with the object of providing employment for some of these men. The majority put on up to the present to dig the trenches have been colliers. Payment is not made by the day, but per yard. The figure is from 10d. to 11d. per yard, which will allow an effective gang to make 5s. 6d. per man per day. The work is expected to take about three months to complete; and it is hoped to have the village lighted by the beginning o winter.

Sidmouth Refuse Destructor Proposal.

An inquiry was held at Sidmouth on the 1st inst. into the application of the Sidmouth Urban Council to the Local Government Board for sanction to borrow £6250 for the purposes of the gas undertaking and the erection of a refuse destructor at the gas-works. The only opposition was to the refuse destructor, which was objected to by the Honiton Rural Council, certain hotel proprietors, and some private residents, on the ground that it was not a suitable site for a destructor, and that it would be the means of depreciating property, affecting health, and damaging the prosperity of Sidmouth as a seaside retort. Mr. H. Burgess (the Gas Manager) said if the destructor was properly worked it would not be a nuisance. It would be a saving on the present cost of the refuse disposal. Mr. J. G. H. Halse said if a destructor were not erected on the proposed site, it would mean continuing in the present unsatisfactory way. Mr. Matthews (the Surveyor) said that under similar conditions to theirs the Exmouth refuse destructor was working satisfactorily, and no complaints had been received. Mr. Burgess stated that £2465 would be required for the purchase of 400 prepayment gas installations, £1625 for extensions at the works, and £1000 for meters and cookers.

Lurgan Gas-Works Purchase.

A special meeting of the Lurgan Town Council last week signed and sealed the agreement between the Council and the Lurgan Gaslight and Chemical Company, Limited, for the purchase of the gas undertaking at £40,000. By the agreement, it was explained, the Company undertook to hand over their entire works and plant, to erect two new engines now on order, to withdraw their Parliamentary Bill for increased powers, and to drop their opposition to the Council's application for a Provisional Order for an electric lighting scheme. The Council, on the other hand, undertook to introduce a Bill, and to use their endeavours to get it passed to complete the purchase. Oct. 1, 1915, was fixed as the day of transfer; but if the purchase money is not then available, the date is to be changed to Jan. 1, 1916. Thereafter 5 per cent. interest is to be charged on the purchase money by the Company until the transfer is completed; and the Company are to run the works in the meantime. The purchase includes all the stoves and meters out on hire. The Town Solicitor (Mr. C. Johnston) said he agreed to 5 per cent. interest because the Company had granted the Council concessions on more important points. The Chairman (Mr. J. Mahaffy, J.P.) remarked that it was optional with them to take over the Company's employees; and they would not take over the pensioners.

The Gas Light and Coke Company and the Territorials.

The current number of the "Co-Partners' Magazine" of the Gas Light and Coke Company is devoted entirely to the subject of service with the Territorial Force, and especially to the doings and the claims of the battalion with which the Company is most closely identified —viz., "The Rangers." As Hon. Colonel, the Governor, Sir Corbet Woodall, D.Sc., supplies the following "Foreword" to the contents of the number, which has for frontispiece a portrait of His Majesty the King: "The Gas Light and Coke Company is a many-sided institution. Its staff includes men of very varied trades and occupations, and also of widely differing sympathies. As the 'Magazine' from the date of its launching has been the mouthpiece of the staff, written to a large extent by them as well as for them, it is appropriate that its pages should be used for the discussion of a question in which so large a number are interested, and upon which there exists some difference of opinion. Speaking for myself alone, I have the keenest sympathy with the service; and this on two grounds—the personal and the national. On the first I have no doubt some contributor will point out how excellent is the effect of the necessary drill upon the physical condition of members of the force. Further, it furnishes interesting occupation and pleasant companionship for long evenings; while life in camp, though strenuous, is looked forward to with happy anticipations from year to year. On both the grounds I have named it would, in my opinion, be well if all suitable men accepted service as Territorials. It is sometimes said that a military training would encourage a warlike, aggressive spirit in the country. The statement is, I think, without justification. Ability to defend his own home does not tend to make a man a burglar, keen to possess himself of the property of his weaker neighbours. As a nation is strong, so will it be calm, free from the panic-spirit which has often led to foolish and injurious action. For the honour, therefore, of our country, as well as for the individual advantage attaching to it, I commend the service to all who are fit for it."

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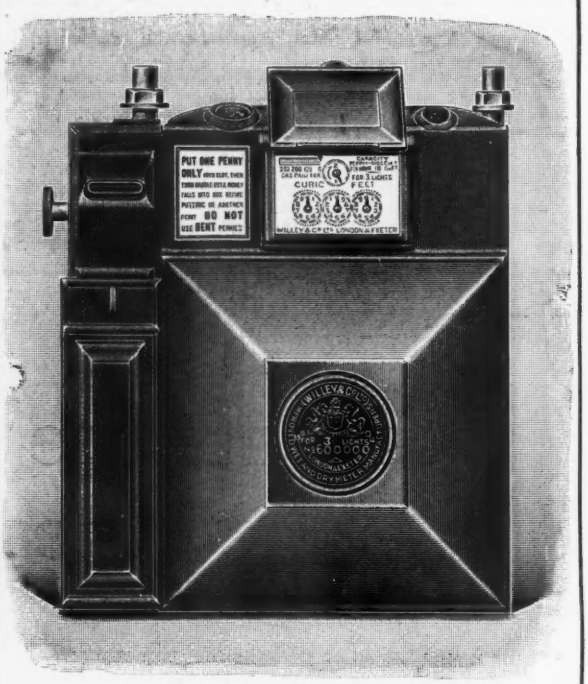

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Sale of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards sold by auction, by order of the Directors, a new issue of £20,000 of 5 per cent. perpetual debenture stock in the South Suburban Gas Company; the prices realized being from £111 to £113 per £100. In the Hemel Hempsted District Gas Company, a £100 4 per cent. permanent mortgage bond realized £80; £50 of "A" stock and £80 of "B" stock (ranking for a standard sliding-scale dividend of 10 per cent., and receiving 9 per cent., sold at the rate of £164 per cent.; and £60 of "C" stock (ranking for a standard sliding-scale dividend of 7 per cent., and receiving £6 6s. per cent.) was disposed of at the rate of £115 per cent. The final parcels submitted were of shares in the St. Albans Water-Works Company. There were 84 £10 fully-paid original shares (receiving a maximum dividend of 10 per cent.), which were sold at £24 to £24 10s. each; 66 £10 fully-paid new ordinary (1879) shares (receiving a maximum dividend of 7 per cent.) at £15 15s. each; and nine £10 fully-paid new ordinary (1900) shares (receiving a maximum dividend of 7 per cent.), at £15 10s. each.

Extending the Electricity Area at Tunbridge Wells.

The Tunbridge Wells Town Council, by a majority, have decided to apply to the Board of Trade for a Provisional Order to extend their electric lighting area. Mr. Gower urged that the electricity business was of an extremely speculative nature, and that it was not fair to the ratepayers that their money should be speculated with in order to benefit people outside the borough boundary who did not contribute a farthing to the upkeep of the town. Mr. Edwards replied that the Committee were safeguarded, and were not speculating with the ratepayers' money. They had not had a penny of the ratepayers' money for the undertaking yet. The consumers did not make a profit; but the ratepayers did. Alderman Delves: The ratepayers do not make a profit, but the consumers do in the reduction of the charges; and the curious thing is that consumers of electricity who are members of the Council can sit here and vote for the reduction of their own bills. The Town Clerk pointed out that nobody could demand a supply in the outside district unless he could get five other consumers to support him. In this respect they were in a much better position than the Gas Company, who had to supply gas on receiving a request from only one consumer.

Stourbridge Gas-Works Report.

In his ninth annual report to the Stourbridge Urban District Council, the Gas Manager (Mr. Charles H. Webb, M.Sc.) states that the sales of gas for all purposes, for the year ended March 31 last, show increases amounting altogether to 8,388,900 cubic feet, as compared with the previous year. The total amount of gas manufactured was slightly under 250,000,000 cubic feet. The prices obtained for residuals have been good, with the exception of sulphate of ammonia, which fell away severely during the second half of the year. Although the price of coal was again increased, the net proceeds of residuals, as a percentage on coal and oil, is 69·2. On revenue account, the income was greater by £1401, the only items which are less being sulphate of ammonia and private lighting (ordinary) – the latter due to a reduction in the price of gas for power. The expenditure is higher on coal and oil, but every other item is about normal, having regard to the growth of the business, with the exception of rates and taxes, where the effect is being felt of an increased assessment. The result is a balance of £11,249. After making the usual deductions of income-tax, annual instalments, and interest, the surplus is £3028; being an increase of £128. During the year there have been fixed seven ordinary and 208 prepayment meters, 314 cookers, and 127 gas-fires, geysers, and heaters. The hire-purchase system has been extended to gas-engines, and Mr. Webb anticipates considerable benefit from this new branch of business. A loan was obtained, contracts let, and a greater part of the constructional work carried out for the retort-house machinery installation.

London County Council and Gas-Meter Testing.—At the meeting of the London County Council last Tuesday, the Public Control Committee recommended that an additional assistant to inspectors of gas-meters be appointed as soon as the Council had approved the necessary estimate. The Committee have under consideration a proposal for the substitution of a new office for one of the existing gas-meter testing offices; but it is necessary in the meantime for immediate action to be taken in order to cope with the continually increasing quantity of work. The number of meters dealt with during the quarter ended March 31 last shows an increase of 7573 over the corresponding quarter of the year 1913; the additional amount of fees received being £246 10s. 6d. The volume of work is still growing; and the Committee are satisfied that there is need for the services of an additional assistant. The recommendation was agreed to.

APPLICATIONS FOR LETTERS PATENT.

14,926.—Shenton, G. H., "Governors." June 23.
14,973.—More, I., "Mantles." June 23.
15,002.—Hinkel, J., "Ignition device." June 23.
15,053.—Soc. l'Air Liquide (Soc. Anon. pour l'Etude et l'Exploitation des Procédés George Claude). "Purification of gases." June 23.
15,085.—Turquand, F. J., "Detection of gas." June 23.
15,092.—Humphrey, A. A., "Pumps." June 23.
15,179.—Glover, G. and Co., Ltd., and Perry, J. J., "Gas-meters." June 24.
15,320.—Edwards, A. D., "Automatic gas-pressure changer." June 26.
15,358.—Sugg, W., and Co., Ltd., and Mattock, W. G. H., "Inverted burners." June 26.
15,375.—Hall, W. A., "Distillation of coal." June 26.

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Yarmouth (I.W.) Water Supply.—The town of Yarmouth, in the Isle of Wight, has received a valuable acquisition in its increased public supply of water; the Freshwater Company having at length completed their 3½ miles of extension of mains. Yarmouth is now in a position to compete with any outbreak of fire that might occur in the district.

Coke for House Fires.—The following appeared under the heading "Told after Shop Hours" in the "Ironmonger" last Saturday: "It would appear that with the increasing use of gas fires and cookers the gas-making companies are producing more coke than they can readily sell. That at least is one explanation of a proposal to make and market a coke-consuming open-fire grate. The dimensions of the fireplace are given as: Height, 2 ft. 6 in.; width, 1 ft. 6 in.; depth from back to front, 5 in. The front bars, which extend from the hearth to within 6 inches of the top, are spaced 2 inches apart; and a lift-off canopy or blower is to be provided to induce draught when the fire becomes sluggish. The fireplace would be filled with broken coke, and the fire, kindled from the top, allowed to burn downward like a candle. To regulate the surface of the radiant coke to the requirements of the season or the weather, a 'slice' must be inserted four, five, or six bars down, below which combustion cannot occur. This part of the scheme is not new; it has been tried with open-front anthracite stoves. The new grate is hardly handsome, and probably there will be a period of development before it attracts much support. Possibly an open coke-fire burning downwards and serving a hot-water supply system would prove a more hopeful proposition."

Manchester Water Supply.—A large number of the members of the Manchester Corporation recently paid a visit, accompanied by the Chairman of the Water Committee (Alderman E. Holt), to Thirlmere, to inspect the water-works after an interval of seven years. The water is at present conveyed by two pipes, and a third is nearly ready. But, according to a hint dropped by Alderman Holt, this will not be sufficient in eight years' time. Indeed, it is believed that Manchester will at no remote date have to look for yet another source of water than Thirlmere to satisfy the requirements of the city.

School Lighting by Gas at Norwood.—At the meeting of the London County Council last Tuesday, the Education Committee reported that they had had under consideration the artificial lighting of the new school for mentally defective children and the enlarged portion of the ordinary elementary school in Gipsy Road, Norwood, and had decided that the buildings should be illuminated by gas. The South Metropolitan Gas Company had submitted an estimate of £471 5s. for installing a system of incandescent lighting, and the Committee proposed that their offer should be accepted. They had also considered as to improving the lighting of certain rooms and halls in the old portion of the elementary school building, and were of opinion that it should be brought up to the standard to be provided in the enlarged portion. They had obtained from the South Metropolitan Gas Company an estimate for this work amounting to £274, which they thought should be accepted; and they had sanctioned the expenditure accordingly. They recommended that the estimates should be accepted; and this was agreed to.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had a fairly satisfactory week; and it would have been much more so if business could only have been electrified into a little more activity. There seemed to be a full determination at the start of the new half year to look only on the bright side of things, and to enforce cheerfulness in spite of discouraging factors. It would have been difficult to point to any real improvement in affairs—domestic or foreign—which have so long paralyzed enterprise; indeed, they were intensified by the Austrian tragedy. Ulster, the financial muddle, Mexico, &c., are still in the cauldron, and none can foresee the end. However, money was cheap and prices were rising, and markets were buoyant. The gilt-edged was as good as any, and Consols rose ⅜ in the week. The opening on Monday was fettered by anxiety as to how Continental bourses might take the crime of Serajevo, and prices were put down in advance. But when this apprehension was allayed, a recovery set in, and Consols closed ⅛ better. The rest, however, showed no amendment. Tuesday was of the quietest; some markets being absolutely stagnant. Government issues did not move, Rails might as well have been closed, and Transatlantics weakened through sheer inaction. Wednesday was dead quiet with no movement. Prices simply melted in the heat—90°. Consols fell ⅛, and Rails shrank in response to offers. The general improvement started on Thursday. Gilt-edged securities were better generally. Consols rose ¼, and Rails were slightly more cheerful; but the rest seemed too inanimate even to catch the happier mood. Friday was quite a good day. All markets were a bit busier and full of cheerfulness. Government issues were well supported by buyers, Consols gained another ¼, Rails effected a moderate advance all round, American were firm, and several speculative lines were active. Matters continued quite buoyant on Saturday. All markets were strong, and some would even have been active if would-be buyers could have found sellers. Consols again rose ¼, and closed at 75⅛ to 75⅜. In the Money Market, there was a strong demand up to the close of the half year. Thenceforward the supply was superabundant. Discount rates eased steadily. Business in the Gas Market was a fair average in point of volume; but it might have been better if there had been more stock available. Movements in quotation were thus but few in number; and they indicated general firmness In Gas Light and Coke issues, the ordinary was moderately dealt in at advancing prices, rising from 102½ to 103½—an advance of 1. In the secured issues, the maximum realized from 77⅛ to 79, the preference 98¾, and the debenture from 73⅛ to 74⅛. South Metropolitan was quiet at 111 to 111½. In Commercials, the 4 per cent. made 107½, and the 3½ per cent. 104½. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 61⅛ and 62, British at 44⅛ to 44½, Brighton at 211 and 212, ditto "A" at 156, South Suburban at 114½ and 115, ditto debenture at 116 and 117 (a rise of 5), Tottenham "A" at 135½, ditto "B" at 115½ and 116½, Wimbledon at 117½, and (on the local Exchange) Liverpool "A" at 211, and ditto "B" at 145½. In the Continental companies, Imperial fetched 162 to 164½, ditto debenture 84⅜, Union 78¼ and 79¼, and European 18¼. Among the undertakings of the remoter world, Ottoman marked 7½, Primitiva 5⅜, and ditto preference 4⅛ and 5.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 4½ per cent. Consols, 75½—75⅝. Previous week, 74⅞—75.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	61—66	..	3 15 9
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	78—81	..	4 12 9
280,000	5	April 29	7½	Bombay, Ltd. . . .	5¼—6⅜	..	5 17 8
50,000	10	Feb. 26	16	Bourne- 10 p.c. .	29—30	..	5 6 8
852,500	10	,,	7	mouth Gas B 7 p.c. .	15—15½	..	4 10 4
75,000	10	,,	6	and Water Pref. 6 p.c.	13½—14	..	4 5 9
880,000	Stk.	Feb. 26	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New . .	204—209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109—111	..	4 10 1
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91—93	..	4 6 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	207—212	..	5 3 9
244,200	,,	,,	8	Do. A Ord. Stk. .	153—158	..	5 1 3
530,000	20	Mar. 26	12½	British	44—45	..	5 11 1
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90*	..	4 8 11
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	87—89*	..	4 9 11
100,000	10	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	..	—
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75*	..	6 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	..	4 10 11
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	..	5 1 2
560,000	,,	,,	5⅛	Do. 3½ p.c. do. .	103—105	..	5 1 6
475,000	,,	June 11	8	Do. 3 p.c. Deb. Stk.	69½—71½	..	4 3 11
800,000	Stk.	,,	4	Continental Union, Ltd.	78—81	..	4 18 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	113⅜—116½	..	6 0 2
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk. .	102—104	..	3 16 11
1,002,180	10	Jan. 15	10	European, Ltd. . . .	18—18½	..	5 8 1
16,386,660	Stk.	Feb. 12	4/17/4	Gas 4 p.c. Ord. . .	102—104	+1	4 13 7
2,600,000	,,	,,	3½	Light 3½ p.c. max. .	76—79	..	4 8 7
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	96—99	..	4 0 10
4,674,850	,,	June 11	3	Coke 3 p.c. Con. Deb.	72⅛—74⅛	+⅛	4 0 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	..	5 12 4
70,000	10	April 29	11	Hongkong & China, Ltd.	16⅛—16⅜	..	6 11 4
131,000	Stk.	Mar. 12	7½	Ilford A and C . . .	151—154	..	4 19 0
65,780	,,	,,	6½	Do. B	115—118	..	5 3 10
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92—94*	..	4 5 1
4,940,000	Stk.	May 14	9	Imperial Continental .	161—166	..	5 8 5
1,235,000	Stk.	Feb. 12	8½	Do. 3½ p.c. Deb. Red.	84—86	..	4 1 5
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A .	210—212	..	4 14 4
718,100	,,	,,	7	Do. B .	144—146	..	4 15 11
806,083	,,	June 26	4	Do. Deb. Stk.	97—99*	..	4 0 10
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅜	..	6 9 9
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	..	4 9 1
541,930	20	May 28	4	Monte Video, Ltd. . .	11⅜—12½	..	6 13 1
1,775,892	Stk.	Feb. 26	4½	Newc'tle&G'tesh'd Con.	£9½—100½	..	4 9 7
529,705	Stk.	June 26	2½	Do. 3½ p.c. Deb.	£2—83*	..	4 4 4
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	..	5 2 8
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	..	6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7⅜	..	6 9 0
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	..	4 19 3
100,000	50	,,	12	Do. C . .	118—121	..	4 19 2
249,980	5	April 29	8	Primitiva Ord. . . .	5⅜—6⅛	..	6 8 0
499,960	5	June 26	5	,, 5 p.c. Pref. .	4⅞—5⅛*	..	4 17 7
521,600	100	June 2	4	,, 4 p.c. Deb. .	91—93	..	4 6 0
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87*	..	4 12 0
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	..	5 9 1
125,000	50	July 1	5	5 p.c. Deb.	47—49*	..	5 2 0
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	..	4 9 3
209,984	,,	,,	10	Do. B	222—224	..	4 9 3
523,500	,,	,,	10	Do. C	220—222	−2	4 10 1
90,000	10	May 28	9	South African . . .	10½—11½	..	7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	110—112	..	4 17 7
1,895,445	,,	Jan. 15	8	Do. 3 p.c. Deb.	74—76	..	3 18 11
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	..	5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110—112	..	4 9 3
117,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118*	+5	4 4 9
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	..	4 18 0
120,000	Stk.	Feb. 12	7⅜	Tottenham A 5 p.c. .	135—138	..	5 6 10
543,940	,,	,,	6½	District B 3½ p.c. .	115—117	..	5 0 5
149,470	,,	June 26	4	4 p.c. Deb.	87—89*	..	4 9 11
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95*	+½	5 5 3
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	..	4 11 4
30,000	Stk.	Feb. 26	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	..	5 7 4
255,636	,,	,,	6½	,, B 3½ p.c.	129—134	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	..	5 2 0
352,000	,,	,,	6½	Wimbledon 5 p.c. .	117—122	..	5 0 5
98,000	,,	,,	6⅝	Epsom 5 p.c. . . .	121—126	..	5 5 2
88,416	,,	June 26	8	3 p.c. Deb. Stk. . .	66—69*	..	4 6 11

Prices marked * are "Ex Div."

Fatality at the Dundee Gas-Works.—A bricklayer named Percy Simpson was killed at the Dundee Gas-Works last week by falling down a chimney stalk from a height of over 100 feet. Deceased, who was about 38 years of age, was in the employment of the Alphons Custodis Chimney Construction Company.

Shipley Gas Accounts.—The annual report of the Shipley Urban District Council gas undertaking, which was submitted at a meeting last week, shows a working profit of over £1300; but there have been exceptional charges for the purchase of condensing plant and for granite paving at the yard, amounting to over £1800. This having been charged against revenue, the reserve fund was reduced from £1371 to £903.

The Lighting of Clapham Common.—At a meeting of the Wandsworth Borough Council on Friday, the Lighting Committee reported that they had considered the resolution referred to them at the last Council meeting [see "JOURNAL," June 23, p. 998] to instal double inverted burners in substitution for the single burners in the lamps on the south side of Clapham Common. They had before them a report of the Lighting Sub-Commitee, who had viewed the lighting arrangements, and were of opinion that the road was sufficiently lighted. The Council adopted the report.

Gas Fatality at Chester.—That death was due to gas poisoning from misadventure was the conclusion arrived at by the Coroner's Jury who inquired into the tragic end of Mr. John Griffiths, of Chester, a former Sheriff of the city, Registrar of the Chester County Court, and a member of the Council. Deceased had suffered from insomnia for some weeks; and a doctor expressed the opinion that he had endeavoured to induce sleep by resting in front of a gas-stove, and inhaling the fumes. He was found one morning lying dead in front of the stove, wrapped up in the bedclothes, with his head on a pillow. The window was open about 6 inchess; and there had been no attempt to close up other apertures in the room.

Mansfield Gas Exhibition.—An exhibition of gas appliances was opened in the Town Hall at Mansfield, last Wednesday evening; the formal ceremony being presided over by Mr. T. Smith (the Chairman of the Gas Committee), who suggested that a great deal more use might with advantage be made of gas, especially for cooking purposes. The Mayor formally declared the exhibition open; and the attendance has since been of gratifying proportions. The Richmond Gas Stove and Meter Company are responsible for a varied and attractive display, in relation to which much discrimination has been exercised by Mr. W. J. Randell Baker, the Corporation Gas Manager. Cookery lectures, with practical demonstrations, are being given daily by Mrs. Ada Hayward.

Slot-Meter Thefts.—A suggestion is made from the Leicestershire Magistrates in regard to possible means of checking slot-meter robberies. There have been many at Loughborough lately; and empty houses have been mainly exploited. To checkmate the delinquents, an arrangement has been entered into between the representatives of the Corporation and estate agents, whereby, in the event of tenants quickly relinquishing possession of their dwellings, information should be forwarded to the Gas Department, so that the collectors might at once attend to take the toll of the meters. In some cases, however, the culprits have anticipated both the house agents and collectors by a good many hours—entering the premises and unlocking the boxes with keys of an easily procurable kind. The magisterial suggestion is that keys of a special type should in future be utilized by the department.

Ely Electric Lighting Scheme.—At a meeting of the Ely Urban District Council last Wednesday, the Clerk read a letter from the City of Ely Gas Company giving notice of their intention to apply to the Board of Trade for a Provisional Order to supply electricity in the parishes of Ely Trinity, Ely St. Mary, Ely College, and the hamlets of Stuntney and Chettisham, in the Ely urban district. The Chairman said the Company had widened their area this time. The application was due to the time having expired for this year. The Clerk remarked that they were making a fresh start—beginning *de novo*. Mr. Theobald said that with the fresh notice of the Gas Company they did not know what the Board of Trade would recommend them to do. A scheme of the Gas Company to supply electricity in the city was the subject of a Board of Trade inquiry some weeks ago [see the "JOURNAL" for May 12, p. 449].

The students of the West Bromwich Municipal Science and Technical and Metallurgical Classes, to the number of about a hundred, have paid a visit to the Corporation gas-works, where they were shown over the new vertical-retort installation by the Assistant-Manager (Mr. Frank Cox), in the absence of the Engineer (Mr. W. H. Johns). At the close of the visit, Mr. Whiteley (the Principal) expressed the thanks of the students to the Gas Committee for allowing the inspection.

The Downton Petrol Air Gas Company, Limited (with offices at Bank Chambers, Salisbury), was registered on June 26 with a capital of £4000 in £1 shares.

The premises of the Southend Gas Company in York Road were broken into some days ago, and a motor-car stolen. Subsequently the car was found abandoned at Shepherd's Bush. Some parts of the mechanism were missing; and the words "Southend Gas Company" on the body of the car had been painted over.

The employees of Messrs. Pinchbeck, Limited, went to Hastings for their annual outing on Saturday, the 27th ult., and an enjoyable day was spent. After dinner Mr. W. Alexander, the Managing-Director of the Company, occupied the chair, and Mr. H. E. Archer, the Secretary, the vice-chair, supported by Mr. F. A. Harling.

A revised cooker pamphlet is being issued by Messrs. Fletcher, Russell, and Co., of Warrington. The copyright pictorial cover invites attention to the inside, where are to be found illustrated particulars of the firm's specialities. Among them may be mentioned the "Housewife" series of cookers and a folding hot-plate designed to fit the hob of an ordinary coal-fire range, for use where space is limited. Several articles from the general list have also been included.

The annual statement of accounts in connection with the Bradford Water-Works was submitted by the City Treasurer (Mr. F. Ogden Whiteley) at a meeting of the Committee last Wednesday week. The income from water supplied for domestic purposes showed a decrease of £5500, due to the concessions granted last year in respect of baths, &c. (amounting to £6000); but the receipts from water supplied for trade disclosed an increase of £9200. Upon the year's working, there was a net profit of £10,870, as against £10,670 a year ago.

At a meeting of the Shipley District Council last week, a letter was read from the Gas-Workers' Union asking for increased wages for lamplighters and new conditions of employment. At the same meeting, a Sub-Committee was appointed to inquire into, and report upon, the question of automatic street lighting. The Clerk was instructed to reply to the Union that improved methods of street lighting were being considered, and that when the matter had been further examined the representatives of the Union wouldbe given opportunity of discussing their question with the Council.

The Wandsworth Borough Council Highways Committee have had under consideration the subject of the hours during which private lamps fixed on the public way should be required to be kept alight. The Committee recommend that the owners be informed that such lamps will be allowed to remain subject to their being properly painted and kept repaired to the satisfaction of the Borough Engineer, to their being kept efficiently lighted from sunset till 10 p.m. on each week night, except Saturday, and on Saturday from sunset till 11 p.m., to their being lighted by the Gas Company's employees, and to their being removed at any time if required by the Council. The Council will not require the lamps to be lighted on Sundays, Christmas Day, Good Friday, or Bank Holidays.

The members of the Leeds City Council last week enjoyed a day's visit to the valley near Masham which is to be the Leighton reservoir in the city's new water-works' scheme. The full extension scheme involves the construction of four new reservoirs; and all the land necessary has been acquired. The immediate work, however, is the Leighton reservoir, work on which is nearing completion. The reservoir will be about a mile in length, covering 105 acres. It will supply 4¼ million gallons of water a day, apart from the 2¾ million gallons of compensation water which will have to be sent down the valley. The work was commenced six years ago, and is expected to be completed in about eighteen months from the present time. The party were under the conductorship of the Leeds Water Engineer (Mr. Charles G. Henzell).

The summer trip of the Leeds City Gas Mains and Distribution Department was this year to Whitby and Scarborough, *viâ* the Yorkshire Moors. The party left Leeds by train for Malton, and then by motor to Pickering, visiting the castle and having breakfast at the White Swan Hotel. The journey was then continued over the moors to Whitby. After spending about two hours in Whitby, the party journeyed by motor on to Scarborough *viâ* Robin Hood's Bay. Dinner was served on arrival. After spending a couple of hours and more in Scarborough, the journey to Leeds was made by train, a smoking concert *en route* in the reserved saloon winding up an enjoyable day's holiday. There was a very general expression of thanks to Mr. Walter Hudson, the Chief Clerk of the Department, and his Committee for the excellent arrangements made for the comfort and convenience of the party. Mr. W. B. Leech, the General Manager, Mr. Walter Hole, the Superintendent of the Department, and his Assistant, Mr. A. E. Leask, accompanied the excursion.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS MANAGER. Cannock, &c., Gas Company. Applications by July 17.
ASSISTANT ENGINEER AND MANAGER. Bath Gas Company. Applications by July 15.
GAS AND WATER ENGINEER. Rhymney and Aber Valley Gas and Water Company. Applications by July 18.
SECOND ASSISTANT. Warrington Gas Department. Applications by July 18.
AGENTS. No. 5904.
WORKING MANAGER. No. 5909.
WORKING MANAGER. No. 5910.
STOKER. King's Lynn Gas-Works.
WATER-GAS PLANT OPERATOR. No. 5905.
METER REPAIRER. Shotley Bridge Gas-Works.

Appointments Wanted.

LADY SCIENTIFIC INSTRUCTOR AND CANVASSER. No. 5901.
ASSISTANT FOR EXTENSION (Recommended). No. 5906.

Plant, &c. (Second Hand), For Sale.

ROTARY STATION METER. Romford Gas-Works.

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HARROGATE GAS COMPANY. By Tender. July 20.

TENDERS FOR

Alterations, &c.

INVERNESS GAS DEPARTMENT. Tenders by July 20.

Gasholders and Tanks.

CARDIFF GAS COMPANY. Tenders by July 22.

Coal.

CLITHEROE GAS DEPARTMENT. Tenders by July 15.
DEVON GAS ASSOCIATION. Tenders by July 13.
GLOSSOP GAS COMPANY. Tenders by July 11.
LINCOLN GAS DEPARTMENT. Tenders by July 18.
MARPLE GAS DEPARTMENT. Tenders by July 15.
NEWPORT (MON.) GAS COMPANY. Tenders by July 21.
SALISBURY GASLIGHT AND COKE COMPANY. Tenders by July 13.
SMETHWICK GAS DEPARTMENT. Tenders by July 15.
STOURBRIDGE GAS DEPARTMENT. Tenders by July 14.
SWINTON AND MEXBOROUGH GAS BOARD. Tenders by July 20.
TODMORDEN GAS DEPARTMENT.
WIGAN GAS DEPARTMENT. Tenders by July 16.

Pipes, &c.

TENDRING RURAL DISTRICT COUNCIL. Tenders by July 27.

Tar and Liquor.

OLDHAM GAS DEPARTMENT. Tenders by July 14.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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